Universidade do Minho
Escola de Psicologia

Eva Martins da Conceição

The Role of Eating Behavior in Obesity Surgery: Assessment, Intervention and Treatment Outcomes

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The Role of Eating Behavior in Obesity Surgery: Assessment, Intervention and Treatment Outcomes

ABSTRACT

Obesity remains a leading public health problem associated with serious risks to physical health that has a substantial impact on psychosocial well-being. Given the difficulty of non-surgical treatments for obesity to achieve a substantial amount of weight loss and maintain weight loss at long-term, bariatric surgery has been considered the most effective treatment for morbid obesity. Obesity surgery has been related to significant improvement in weight, quality of life, self-esteem and social function. However, a subgroup of patients fails to achieve significant weight loss or regain weight after initial improvement. Different studies suggested that the presence of maladaptive eating behaviors and related psychological symptoms might influence surgical outcomes. For example, presence of binge eating, use of food to cope with intense mood states and life stressful events, loss of control, and grazing behavior, all seem to play an important role in treatment outcomes. Thus, the importance of studying eating behaviors and its relationship with weight regain and weight loss imposes in order to promote successful outcomes after bariatric surgery.

This dissertation will explores the role of eating disorders and eating patterns in the outcomes of bariatric surgery, from pre-surgery binge eating status, to the long-term outcomes, describing an intervention program for bariatric surgery preparation, and addressing the importance of a validated measure to assess specific maladaptive eating behaviors in this population.

The *First Chapter* addresses "Eating Disordered Symptoms in Obese Patients Undergoing Obesity Surgery: Comparison of a Binge and Non-Binge Group". Main results provide additional evidence to the existence of distinct groups of patients presenting for bariatric surgery. Data showed that despite the similar preoperative BMI, binge eating obese patients differed significantly in several dimensions of eating disordered symptoms and general psychological distress.

The *Second Chapter* describes a "Group Preparation for Bariatric Surgery", a psychoeducational program designed to prepare patients for the surgical process, supporting an informed decision and enlightening the surgery process' implications in different aspects of life.

The *Third Chapte*r presents the validation and psychometric properties of a new measure aimed to address and screen for the specific maladaptive eating behaviors and associated psychological features of obese patients undergoing bariatric surgery: the "Obesity Disordered Eating Questionnaire - ODE: a Self-Report Measure for Dysfunctional Eating in Obese Patients Undergoing Bariatric Surgery". Main results showed that the ODE is a good self-report questionnaire to evaluate eating disorder common clinical features and useful to screen for dysfunctional eating behaviors.

Finally, the Forth Chapter explores the "Treatment Outcomes in Bariatric Surgery: the Role of Eating Behaviors and Eating Symptomatology", analyzing changes in eating behaviors with surgery, and the point prevalence of disordered eating behaviors before and after surgery, at short and long-term follow-up. This chapter also explores the impact of postoperative eating behaviors on weight loss and weight regain. Main findings suggest that an initial improvement in eating behavior and related symptomatology with bariatric surgery is observed, but that weight regain seems to occur in the presence of a set of different interactive variables related to dysfunctional eating features.

Since eating behaviors present a strong association with weight regain or treatment failure (particularly at long-term follow-up), a stepped-care approach seems the most reasonable choice to deliver the adequate amount of help adequate to each patient. Therefore, initial preparation to allow a fully inform decision, and a long-term systematic monitoring of specific eating behaviors seems crucial to prevent weight regain.

O Papel do Comportamento Alimentar na Cirurgia da Obesidade: Avaliação, Intervenção e Resultados do Tratamento

RESUMO

A obesidade constitui um problema de saúde pública emergente, que se associa a riscos elevados para a saúde física e que tem um impacto substancial no bem-estar psicossocial do indivíduo. Dada a dificuldade dos tratamentos não cirúrgicos para a obesidade em atingir perdas de peso substanciais e manter os resultados a longo-prazo, a cirurgia bariátrica tem vindo a ser considerada a intervenção mais eficaz no tratamento da obesidade mórbida. A cirurgia da obesidade tem sido também associada a melhorias significativas no peso, qualidade de vida, auto-estima e funcionamento social. No entanto, parece haver um subgrupo de pacientes que não atinge perdas de peso significativas, ou volta a aumentar de peso após uma melhoria inicial. Vários estudos têm sugerido que a presença de comportamentos alimentares desadaptativos e sintomas psicopatológicos associados influenciam os resultados terapêuticos. Entre outros, a presença de ingestão compulsiva, o uso da comida para lidar com estados de humor intensos e eventos de vida stressantes, a perda de controlo e o petisco contínuo parecem ter um papel importante nos resultados do tratamento. Assim, a importância do estudo dos comportamentos alimentares e da sua relação com o aumento e perda de peso depois da cirurgia impõe-se, de modo a promover o sucesso do tratamento.

Esta dissertação irá explorar o papel da perturbação alimentar e padrões alimentares nos resultados, em termos de perda de peso, da cirurgia da obesidade, desde a condição de ingestão compulsiva no período pré-cirurgia, até aos resultados a longo-prazo, passando pela descrição de um programa de intervenção em grupo de preparação para a cirurgia da obesidade, e pela abordagem da importância de uma medida validada de avaliação dos problemas disfuncionais específicos desta população.

O *Primeiro Capítulo* irá abordar "Sintomas de Comportamento Alimentar nos Pacientes Obesos em Cirurgia da Obesidade: Comparação de um Grupo de Sujeitos Com e Sem Compulsão Alimentar". Os principais resultados evidenciam a existência de um grupo distinto de pacientes que se apresentam para cirurgia bariátrica. Os dados

mostraram que, apesar dos grupos apresentarem IMC semelhantes no momento pré-cirúrgico, os pacientes com compulsão alimentar diferem significativamente em várias dimensões relacionadas com a sintomatologia alimentar e *distress* geral psicológico.

O *Segundo Capítulo* apresenta a descrição de um "Grupo de Preparação Para a Cirurgia Bariátrica", um programa psicoeducacional desenhado para a preparação dos pacientes para o processo cirúrgico, apoiando e suportando a tomada de uma decisão consciente e informada e alertando para as implicações do processo cirúrgico nos diferentes aspectos da vida.

No *Terceiro Capítulo* será apresentado o estudo de validação e as propriedades psicométricas de um novo instrumento que pretende avaliar e identificar comportamentos alimentares disfuncionais específicos e características psicológicas associadas da população obesa em cirurgia da obesidade: o "Obesity Disordered Eating Questionnaire – ODE: Uma Medida de Auto-Relato Para Comportamentos Alimentares Disfuncionais em Pacientes Submetidos a Cirurgia Bariátrica". Os resultados mostraram que o ODE revelou ser uma boa medida de auto-relato para avaliação de comportamento alimentar disfuncional e característica associadas, e útil na identificação de comportamentos alimentares disfuncionais nesta população.

Por último, o *Quarto Capítulo* explora os "Resultados Terapêuticos na Cirurgia da Obesidade: O Papel dos Comportamentos Alimentares e da Sintomatologia Alimentar", analisando as alterações nos comportamentos alimentares com a cirurgia e a prevalência destes comportamentos antes e depois da cirurgia, a curto e a longo-prazo. Este capítulo explora ainda o impacto dos comportamentos alimentares presentes após a cirurgia na perda e posterior aumento de peso. Os resultados apontam para uma melhoria inicial dos comportamentos alimentares e sintomatologia associada, mas para um aumento de peso posterior associado à presença de um conjunto de variáveis em interacção relacionadas com características alimentares disfuncionais.

Uma vez que os comportamentos alimentares apresentam uma forte associação com o aumento de peso e insucesso do tratamento (particularmente a longo-prazo), uma abordagem por passos parece a opção mais razoável para levar a intensidade e tipo de tratamento mais adequado a cada paciente, Assim, torna-se fundamental uma preparação inicial que permita a tomada de decisão informada, assim como uma avaliação e monitorização sistemática a longo-prazo dos comportamentos alimentares específicos, de modo a prevenir o insucesso terapêutico.

INDEX

INTRODUCTION

Obesity, Obesity Treatment and Bariatric Surgery

The World Health Organization has considered Obesity as a current endemic disease in developed countries, with serious public health implications (WHO, 2000). In Portugal, recent studies reported that 38,6 % of the general population is overweight and 13,8% has obesity, which altogether, represents about half of the population (52,4%). These data also suggested an increase of the overweight/obesity prevalence in the previous decade (I. do Carmo et al., 2006), when compared to a previous study that assessed obesity from 1995-1998 (I do Carmo et al., 2000) where the authors reported 35,2% of the population overweighted and 14,4% with obesity, being 49,6% the total. Moreover, the Portuguese Association for Health Economy, has estimated in 1996 that 3,5% of the total health costs would be related with obesity, representing an important part of the expenses (Pereira, Mateus, & Amaral, 1999). In 2002, however, the indirect total cost of obesity estimated was 199,8 million Euros, with mortality representing 58,4% and morbidity 41,6% of the total expenses. The indirect part of the expenses was estimated as 40,2% of the total costs of obesity (Pereira & Mateus, 2003).

Considered a major public health problem in western societies with increasing prevalence, obesity is associated with significant morbidity, increased mortality (L. K. George Hsu et al., 1998; Gerbrand C. M. van Hout, Verschure, & van Heck, 2005), and enormous psychological burden (Bocchieri, Meana, & Fisher, 2002; Herpertz et al., 2003). Non-surgical treatments, such as behavior modification programs, nutritional prescription or pharmacological treatments, present some mild outcomes with 8-10% reduction in initial weight and improvement of health and psychological status. However, these options may only be effective for mild to moderate obesity, and the maintenance of weight loss poses serious concerns (Cooper & Fairburn, 2001).

Therefore, surgical procedures involving the gastrointestinal system have been recommended for the treatment of obesity, being considered to be the most effective, and frequently resulting in significant weight loss with long-term outcomes (Cooper & Fairburn, 2001; L. K. George Hsu et al., 1998; Sarwer, Wadden, & Fabricatore, 2005). However, there is a big variably in surgical treatment outcomes. Some patients fail to lose a significant amount of weight, others experience a weight regain after initial successful weight loss, and conversion surgery into another bariatric surgery is a common procedure. (Colles, Dixon, & O'Brien, 2008; Kalarchian et al., 2002; Poole et al., 2005),

Maladaptive Eating Behaviors in Bariatric Surgery

Several non-surgical factors have long been reported as influencing outcomes of bariatric surgery (L. K. George Hsu et al., 1998; Sarwer et al., 2005; Gerbrand C. M. van Hout et al., 2005), but a lot of attention has been paid to the study of predictors of treatment outcomes, to allow a better guidance pre and post surgery and promote successful weight loss. Failure to treatment has been extensively associated with incapacity of following nutritional prescriptions concerning diet choice or the speed of food intake. In fact, research has reported a high prevalence of maladaptive eating patterns such as binge eating (Green, Dymek-Valentine, Pytluk, Grange, & Alverdy, 2004; Kalarchian et al., 2002), loss of control (Burgmer et al., 2005; Colles et al., 2008), continuous snacking (grazing) and emotional eating (Fischer et al., 2007; Saunders, 2004), sweet eating or consuming large quantities of sweets or liquid foods (Sugerman, Starkey, & Birkenhauer, 1987), that have been associated with increased caloric intake, poorer outcomes and ultimately, failure to treatment (Bocchieri et al., 2002).

In order to study the relationship between eating behaviors and bariatric surgery, it is important to understand that not only eating behavior impacts surgery outcomes; surgery itself changes drastically eating behavior.

Changes in Eating Behavior: Normalization and Improvement of Eating Patterns and Psychological Related Features

Some studies have shown that after surgery is observed a normalization of eating patterns with fewer meals, less food consumed at each meal, less eating between meals and less eating in response to strong emotions, as well as a significant decrease in bulimic episodes, secretive eating and hyperphagia (Bocchieri et al., 2002). Binge eating status also seems to disappear with surgery in an important percentage of cases (Larsen et al., 2004; Mitchell et al., 2001; Scholtz et al., 2007), and an improvement on psychological associated characteristics, such as depression, self-esteem (Burgmer et al., 2007) hunger and disinhibition is observed even at long-term follow-up, and for different surgical procedures (Bocchieri-Ricciardi et al., 2006; Bocchieri et al., 2002).

Mitchell and colleagues (2001) in a long-term follow-up (13-15years) of patients after gastric bypass, reported a lower prevalence of binge eating disorder (BED), with the majority of individuals meting criteria for binge eating disorder pre-surgery, not meeting such criteria at long-term follow-up, even if the criterion for eating a large amount of food is excluded. Out of 78 patients, 40 were non-BED pre-surgery, 29 patients reported BED pre-surgery but not post-surgery (n=29), and a smaller proportion of patients with BED pre-surgery still showed BED at post-surgery (n=9). Larsen et al. (2004) came to similar conclusions in their cross-sectional study that assessed 93 patients before laparoscopic adjustable gastric banding, 48 in a short-term follow-up of

less than 24 months, and 109 patients at 25 through 68 months after surgery. Again, point prevalence of eating disorders reported after surgery was lower. BED was present in 55,9% of the patients evaluated preoperatively, 31,9% at short-term, and 37,4% at long-term, also suggesting the improvement of eating behavior after surgery for severe obesity.

Changes in Eating Behavior: Reemergence of Maladaptive Eating Behaviors

In other hand, some studies have also concluded that eating behaviors tend to change with surgery, and new maladaptive eating patterns might appear after surgery. Although binge eating may be physically impossible due to surgical restriction, a different form of compulsive eating may appear after surgery, and new maladaptive eating behaviors (previously described in this introduction section), like grazing, rumination (chewing food, then spitting it out) (Saunders, 2001) and loss of control (White, Kalarchian, Masheb, Marcus, & Grilo, 2010) might appear to serve the same function as the previous binge eating (Saunders, 2001, 2004; White et al., 2010), resulting in excessive caloric intake and ultimately weight regain (G. van Hout, 2005).

As an example, in a work by Colles, Dixon and O'Brien (2008) with a 12 month follow-up observational study, while the prevalence of eating disturbances (BED, uncontrolled eating and Night Eating Syndrome) was significantly reduced at post-surgery, gazing behavior was found to be present before and after surgery in 26,3% and 38% of the evaluated sample, respectively. More interestingly, preoperative BED patients most frequently became grazers after surgery and postoperative uncontrolled eating overlapped with grazing behavior. Together, these maladaptive behaviors were associated with poorer outcomes and higher psychological distress.

Other eating related problems such vomiting, plugging and dumping have been reported as being related with dysfunctional eating. Despite not being disordered eating behaviors, these problems usually emerge in reaction to problematic eating like eating big amounts of food or inappropriate choice of foods not tolerated (Sarwer et al., 2005; G. van Hout, 2005). Moreover, the presence of vomiting in these patients have been associated with less weight loss, suggesting an underlying problematic eating pattern (Pessina, Andreoli, & Vassallo, 2001).

Eating Behavior and Surgical Outcomes: The Role of Preoperative BED

Despite the relationship between disordered eating patterns and poorer outcomes, the predictive value of eating behavior on weight outcomes after bariatric surgery is still far from consensual. In fact, findings regarding the impact of preoperative binge eating are mixed. Some studies reported an association with BED status at pre-surgery and the outcomes at post-surgery (L. K. G. Hsu, Sullivan, & Benotti, 1997; Pekkarinen, Koskela, Huikuri, & Mustajoki, 1994; Sallet et al., 2007; Gerbrand C. M. van Hout et al., 2005). Hsu, Sullivan & Benotti (1996) reported an interaction effect between pre-surgery eating disturbances and length of time since surgery that significantly predicted poorer outcomes. The authors concluded that the initial improvement in their eating disorder following Gastric Bypass erodes after 2 years in patients with a pre-surgical eating disorder, which is related to weight regain. Also Sallet at al (2007), reported that at 2-year follow-up, pre-surgery non-binge eaters showed a significantly higher percentage of excess BMI loss than the subjective binge eaters and the binge eaters. They concluded that pre-surgery binge status is negatively

associated with weight loss after surgery, and that this correlation can be seen as early as at one year follow-up, becoming more clearly manifested after 2 years.

In the other hand, several studies have found no relation between pre-surgery eating behavior and post-surgery outcomes, reporting a substantial improvement in global functioning and weight loss for both BED and non-BED patients, (Burgmer et al., 2005; Powers, Perez, Boyd, & Rosemurgy, 1999; White et al., 2010; White, Masheb, Rothschild, Burke-Martindale, & Grilo, 2006), and that binge patients do not differentiate from their non-binge counterparts after surgery in relevant psychological features (Bocchieri-Ricciardi et al., 2006; Green et al., 2004; Malone & Alger-Mayer, 2004). For instances Green and colleagues (2004) reported significant differences between the binge (BE) and non-binge eaters (NBE) for social-role functioning, disinhibition, and hunger, with the binge group exhibiting a lower percentage of excess weight loss, which partially support the hypothesis of a less successful outcome for the binge eating patients. However, most these differences seemed clinically insignificant (e.g., percent of excess weight loss for NBE 46.8% versus BE 41.2%).

Eating Behavior and Surgical Outcomes: The Role of Postoperative BED

As the impact of pre-surgical binge status on outcome remains to be determined, another body of studies suggests that preoperative features alone are not good predictors, but postoperative eating characteristics are of better prognostic value of surgical outcomes. It seemed that the presence of postoperative dysfunctional eating and the development or reemergence of maladaptive eating-related cognitions and behaviors (loss of control, grazing, sweet eating, disinhibition, etc.) (Colles et al., 2008; Saunders,

2001) after surgery seem to be more likely related to poor outcome (Burgmer et al., 2005; Kalarchian et al., 2002; Scholtz et al., 2007; White et al., 2010) .

In the same study described before of Mitchell and colleagues (2001), patients with preoperative binge eating showed similar weight outcomes as patients that never binged, and only the patients who redeveloped binge eating after surgery (a small proportion of the entire sample) regained weight.

In another very comprehensive study also cited before (White et al., 2010), the authors tested the hypothesis that "Weight loss would be a function of preoperative loss of control (LOC), postoperative LOC and time". They have found that preoperative LOC had no influence on weight loss, but time since surgery and postoperative LOC were highly significant predictors of weight loss. Furthermore, the authors also tested the prospective effects of loss of control. They have concluded that preoperative LOC did not predicted weight loss (WL) at any follow-up times, but LOC at 6 months significantly predicted WL at latter assessment times, and LOC at 12 months significantly predicted weight loss at 24 months. In addition, the proportion of patients with loss of control that regained weight at follow-up was significantly different from the proportion of patients without LOC presenting weight regain. Finally, these same authors studied the hypothesis that "Postoperative LOC would be a function of preoperative LOC and length of time since surgery" concluding that the presence of LOC would increase with time and the preoperative LOC only predicted postoperative LOC (but not weight loss), which has been also reported by other authors (Gerbrand C M van Hout, Hagendoren, Verschure, & vanHeck, 2009; White et al., 2010).

The inconsistencies in the data and the variability in weight loss after surgery, highlights the importance of studying the eating patterns and eating characteristics associated with surgery outcomes, in order to identify and give better guidance/support to patients at risk. This dissertation will explore the role of eating disorders and eating patterns in obese patients undergoing bariatric surgery.

First, the eating related characteristics of the obese patients presenting for bariatric surgery will be analyzed in order to describe the psychological specificities of the eating disordered group;

Secondly, a preparation group for bariatric surgery program, designed to enhance commitment and a fully informed decision, will be then described in terms of basic assumptions, main topics and specific objectives of each session,

A self-report measure designed to screen and evaluate the specific maladaptive eating behaviors of the bariatric surgery population will then be presented, and;

Finally, an analysis of the relationship between eating behaviors and outcomes at short and long-term will be presented.

CHAPTER I

Eating Disordered Symptoms in Obese Patients Undergoing Obesity Surgery: Comparison of a Binge and Non-Binge Group

E. Conceição, A.R. Vaz, P.P. Machado

Abstract

BACKGROUND: Presence of eating related psychological symptoms has been associated to poorer outcomes after bariatric surgery. This study aimed at analyzing the differences in eating disorders psychological symptoms and associated characteristics between binge and non-binge eaters candidates for bariatric surgery.

METHODS: Patients (n=202) scheduled for bariatric surgery were evaluated prior to surgery. Assessment consisted in a clinical interview and several self-report measurements for: Eating disordered symptoms (EDE-Q), Psychological distress (OQ-45), Depressive symptoms (BDI), Impulsivity (BIS-11), and Body Shape (BSQ).

RESULTS: Despite no differences between the bingers (23% of the sample) and non-bingers were found in BMI, Bingers revealed significantly highest food, shape and weight concerns, highest total EDE score, most depressive symptoms, symptom distress and highest scores in impulsivity and body dissatisfaction.

DISCUSSION: Binge eating obese patients differed significantly in several psychological eating disordered related dimensions. Eating patterns should be assessed in treatment as it might influence bariatric surgery outcomes.

KEY-WORDS Bariatric surgery, binge eating, psychological comorbidities

INTRODUCTION

The treatment for extreme obesity has been widely studied and bariatric surgery has been considered the most viable alternative for the most severe patients (NIH, 2000). However, this medical procedure requires, in a postoperative stage, substantial changes in life style, especially regarding the amount and frequency of eating, and food choices (Bocchieri, Meana, & Fisher, 2002). Treatment failure has been associated with inadequate compliance with nutritional prescriptions (Poole et al., 2005), and particularly to some maladaptive eating behaviors (Pessina, Andreoli, & Vassallo, 2001).

Research showed that presence of Binge Eating, use of food to cope with intense mood states and life stressful events, specific eating patterns (e.g., grazing/nibbling), as well as the presence of depressive symptoms or dissatisfaction with weight loss, seem to play an important role in treatment outcome (de Zwaan et al., 2002; Niego, Kofman, Weiss, & Geliebter, 2007; Pekkarinen, Koskela, Huikuri, & Mustajoki, 1994; Peterson et al., 2000; Sallet et al., 2007).

In addition, Binge Eating Disorder (BED) and Binge Eating behaviors appear to affect a high percentage of obese patients seeking weight loss surgical treatment. Estimates vary from 11% up to more than 50%, depending on the study and diagnostic criteria used (Adami, Gandolfo, Bauer, & Scopinaro, 1995; Dziurowicz-Kozlowska, Wierzbicki, Lisik, Wasiak, & Kosieradzki, 2006; Herpertz, Kielmann, Wolf, Hebebrand, & Senf, 2004; L. K. G. Hsu et al., 1998; Kalarchian, Wilson, Brolin, & Bradley, 1998; Powers, Perez, Boyd, & Rosemurgy, 1999)

However, most recent studies failed to associate the presence of BED before surgery with weight loss (Herpertz et al., 2004; Powers et al., 1999). Some authors suggested that binge eating behavior tends to disappear (Mitchell et al., 2001; Powers et

al., 1999) or change in the post- surgery period, emphasizing that Binge Eating status is not stable over time (Bocchieri-Ricciardi et al., 2006; Green, Dymek-Valentine, Pytluk, Grange, & Alverdy, 2004; Herpertz et al., 2004; Larsen et al., 2004), and in some cases BED was not a predictor of poor weight loss (Bocchieri-Ricciardi et al., 2006).

Nonetheless, poor outcome in surgical treatment is mainly related with post-surgery maladaptive eating patterns (Bocchieri et al., 2002; Herpertz et al., 2004; Kalarchian et al., 2002) and compliance with nutritional prescriptions (Peterson et al., 2000; Poole et al., 2005). Larsen, van Ramshorst and Geenan (2004) found that, despite the significant improvement in eating disordered behaviors, there were still patients engaging in some eating disordered behavior after surgery, showing highest fat intake, external eating, emotional eating, and least eating behavior self-efficacy. Poole, Al-Atar and Kuhanendran et al. (2005), in a retrospective study, found that "Emotional triggered Eating" and "Grazing" were associated with missed medical appointments and poor compliance with prescribed dietetic rules. After surgery it is also common to find patients consuming great amounts of hipercaloric food, such as sweets, and the presence of "grazing behavior" or subjective binge eating episodes (Green et al., 2004; L. K. G. Hsu et al., 1998).

On other hand, research has studied the association between maladaptive eating patterns and psychological characteristics. Several studies suggested that depressive symptoms are generally associated with Eating Disorders (Bulik, Sullivan, & Kendler, 2002; Telch & Agras, 1994) and lowest compliance to treatment in several medical procedures (Averbukh et al., 2003; Herpertz et al., 2004), and that emotional eaters tend to have highest levels of depression (Fischer et al., 2007), which might compromise the success in weight loss of some surgical procedures (Delin, Watts, & Bassett, 1995).

Along with depression, the relationship between impulsiveness and eating behaviors, and its association with poor treatment outcomes (de Zwaan et al., 2002; Pessina et al., 2001) has been studied. Nasser and colleagues (2004) compared impulsivity and meal intake in Obese BED and non-BED women, found a significant positive correlation between Motor Impulsivity and each of the following variables: BED status, Loss of Control during a Binge episode, mood before test meal, "Eating when not physically hungry" and "Eating alone embarrassed" items.

In summary, it seems to be relevant to evaluate and access dysfunctional eating behaviors and related psychological characteristics (distress, eating attitudes, loss of control, etc), that might persist post-surgery, influencing its outcome.

The current study aims at describing the psychological eating disordered related characteristics in extreme obese patients undergoing obesity surgery for weight reduction, as well as the relationship between BED status and associated psychological features.

MATERIAL AND METHODS

Participants

Two hundred two patients (24 men and 176 women), scheduled for bariatric surgery in two central hospitals in the North of Portugal, participated in this study. The mean age was 41.54 years old (S.D.= 10.75) and the mean BMI 44.13 (S.D.= 5.47).

Patients had already been screened for endocrinal and psychiatric conditions (e.g., endocrine deregulation, substance abuse, psychotic disorder). Patients were under nutritional guidance in preparation for bariatric surgery.

Procedure

Patients were evaluated prior to surgery by a Psychologist or Psychiatrist with training in Eating Disorders treatment and evaluation. Assessment consisted of a clinical interview and a set of self report questionnaires.

Measures

- A clinical interview accessed socio-demographics and clinical features, such as BMI, current and past treatment and current and past medication; eating habits and eating disorder symptoms based on the Eating Disorder Examination, (Fairburn & Cooper, 2003). This interview allowed the clinician to establish the eating disorder diagnosis and to assess eating patterns and attitudes. It included items to evaluate "Grazing" Behavior, considered when patients reported consuming repeatedly modest quantities of food between standard snack and meal times, not planed and with feeling of loss of control, and usually in response to cravings, boredom and other emotions.
- Eating Disorder Examination – Questionnaire, EDE-Q (Fairburn, & Beglin, 1994). A self-report questionnaire to access eating disorder symptoms and common characteristics. This 28 items questionnaire generates 4 subscale scores (restraint, eating concern, shape concern, and weight concern), as well as a global score. Patients answer in a 7-point scale (i.e. 0–6) indicating the number

of days out of the previous 28 in which particular behaviors, attitudes, or feelings occurred.

- Barratt Impulsivity Scale – BIS-11 (Patton, Stanford, & Barratt, 1995). A 30 items self-report questionnaire developed to access impulsivity, designed as a 4-points rating scale (Never to Always). The scale allows three subscores: motor (acting without thinking), cognitive (quick decisions), and non-planning (present orientation).
- Body Shape Questionnaire – BSQ (Cooper, P.J., M.J. Taylor, Z. Cooper & C.G. Fairburn, 1987). A 34 item self-report questionnaire to evaluate concerns about body and shape in eating disorders patients. Respondents rate its answer in a 0 to 6 scale regarding feeling about their appearance over the past four weeks. It generates a total score with higher scores corresponding to clinically relevant concerns about weight and shape.
- Outcome Questionnaire - 45 – OQ45.2 (Lambert & Burlingame, 1996). A 45 item self-report questionnaire that assesses general psychological distress and social impairment. Items are generate 3 subscales (interpersonal relationships, social roles, and symptom distress) and a total score scale. Patients respond in a 5-point rating scale (Never to Always).
- Beck Depression Inventory, BDI (Beck, Steer, & Garbin, 1988), the widely known self-report questionnaire, commonly used in research as a measure of depression symptomatology.

Data analysis

Participants were divided in two groups on basis of the presence or absence of Binge Eating Disorder (BED) symptoms, as accessed by the Eating Disorder

Examination Interview. The Binger group was defined by the presence of Binge Eating episodes in the last 3 months, as opposed to the DSM-IV appendix (American Psychiatric Association, 1994), which requires the length of 6 months. For the purpose of the current study, the Binger group included patients with full BED criteria, defined by the presence of Binge Eating (BE) episodes at least twice a week for the last 3 months, as well as partial BED criteria patients, reporting on average of at least one BE episode a week over the last three months. For the Binger group we have included both objective and subjective binge eating. Subjective binge episodes are those where the amount of food eaten during the episode is not extremely large but is seen as excessive by the patient.

On the other hand, the non-binge eaters group was defined by the absence of binge eating episodes or having as less than one of these episodes per week in the last 3 months.

In order to examine the psychopathological differences between the two groups (Bingers and non-Bingers) throughout the different subscales and questionnaires, t-tests for independent samples were used to test differences on continuous variables with normal distribution (total scores - EDE-Q, OQ.45, BSQ,). Bonferroni adjustment was used to protect against inflated alpha-level caused by multiple comparisons. For continuous variable in where normality was not established, non-parametric testing: Mann-Whitney U test was used (BIS11 total score and subscales, BDI total score and EDE subscales). For OQ45 subscales we used MAVONA to test the difference between the groups. Finally, Chi-squared test was used to analyze the differences in the categorical variables (Grazing).

Analyzes were conducted with SPSS 16 for Windows and p-values bellow 0.05 were considered statically significant.

RESULTS

As shown in Table 1, the EDE interview identified Binge Eating symptoms in 23.3% os the evaluated subjects, with 9,4% reporting Subjective Binge Eating and 13,9% reporting Objective Binge Eating episodes, as defined above.

No differences between the bingers and non-bingers were found in Age (t(194)= -0.242714, n.s.) and BMI (t(195)= 0.999, n.s.).

Table 1 – Socio-demographic information

	% (N)	
	Bingers	**Non-bingers**
N (202)	23.3(47)	76.7(155)
Subjective BE	9.4(19)	-
Objective BE	13.9(28)	-
Gender		
Men	5	19
Women	40	136
	M (SD)	
Age (Years)	41.89(10.52)	41.44(10.84)
BMI (kg/m²)	43.40(6.40)	44.34(5.18)

Significant differences were found between the two groups in the presence of Grazing [$\chi 2(1)=6.453$, 0.011], with 46,8% of the bingers against 27.7% of the non-bingers (6 out of 9) reporting this behavior (see Table 2).

Analyses have also shown differences in the distribution between the two groups when patients expressed themselves about their weight, as seen in Table 2. When asked how much their weight influenced their everyday life and how afraid they were of gaining more weight, binge patients reported higher levels for influence of weight ([Z= -3.377, $p<0.05$]) and fear of gaining weight ([Z=-2.74, $p<0.01$]), when compared with their non-Binger counterparts.

Table 2 – Comparison between obese bingers and non-bingers: "Grazing" behavior, weight influence and fear of gaining weight.

	% (N)		**statistics**	*p-value*
	Bingers	**Non-Bingers**		
"Grazing"(n=153)	46.8(22)	27.7(43)	6.453*	<0.05
How much does your weight influence your life? (n=156)			-3.377**	0.001
How afraid are you of gain weight? (n=156)			-2.740**	<0.01

*Chi-square test ($\chi 2$) – Yate's Correction for Continuity
**Mann-Whitney U teste (Z)

Table 3 presents mean scores and standard deviations for the binge and non-binge patients on each of the scales used in the pre-surgery assessment, and highlights the differences founded between the two groups.

Table 3 – Comparison between obese bingers and non-bingers: Self-report measures for eating disorders, general distress, depressive symptoms, body shape and impulsivity.

	M (SD)			**Stats**	*p-value*
	Bingers	**Non-bingers**	**Cut point/ Controls**		
EDE-Q (n=159)					
Restraint	2.18(1.43)	1.74(1.42)		-1.744 [b]	*ns*
Shape Concern	4.93(0.96)	3.66(1.38)		-4.971 [b]	0.000
Food Concern	2.77(1.40)	1.03(1.04)	*cp*>3.5	-6.388 [b]	0.000
Weight Concern	4.70(0.94)	3.68(1.26)		-4.404 [b]	0.000
Total Score	3.64(0.86)	2.51(0.96)		-6.325[a]	0.000
OQ-45 (n=141)					
SD	43.1(16.79)	29.73(13.67)	29.66(12.04)[1]	19.05 [c]	0.000
IR	14.62(7.18)	10.9(5.73)	11.14(5.15)[1]	8.27 [c]	0.005
SR	12.49(3.82)	10.08(3.98)	11.49(3.86)[1]	8.14 [c]	0.005
Global Score	70.20(24.18)	50.71(20.07)	52.20(19.04)[1]	-4.357 [a]	0.000
BIS-11(n=150)					
Attentional	20.66(4,63)	17.93(4.74)		-2.884[b]	<0.005
Motor	23.27(4.32)	21.23(3.11)		-2.344 [b]	<0.05
Non-planning	26.51(3.54)	27.17(4.61)		-1.024 [b]	*ns*
Total Score	69.88(7.59)	65.96(8.65)		-2.229 [b]	<0.05
BDI (n=154)					
	17.56(9.46)	10.25(8.36)	*cp*>12	-4.095 [b]	0.000
BSQ (n=84)					
	123,43(30.16)	98.61(36.99)	81.5 (28.4)	-2.355 [a]	≤0.05

[1]Machado PP, Machado BC, Klein J. Portuguese version of The Outcome Questionnaire. Universidade do Minho. Unpublished Manuscript.
[a] – T-test (t(df)); [b] – Mann-Whitney U teste (z); [c] – MANOVA (F)

Bingers scored significantly higher than the non-Bingers on the total EDE-Q score [t(157)=-6.325, p=0.000] and all subscales, except for the restraint subscale. In addition, the Binger group scored significantly higher on every OQ45 subscales and total score [t(139)=-4.357, p=0.000] the general psychological distress measure.. These scores were also higher than the normative population's, which is not seen in their non-Binger counterparts whose scores ranged within the normal scores.

Significant differences were, also, found in the impulsivity, BIS-11total score [Z=-2.229, $p<0.05$] and every subscale (attentional and motor impulsivity), with exception of the non-planning subscale.

The Binger group presented, also, significantly highest values for depression, as assessed by BDI [Z=-4.095, 0.000], with scores falling within the clinical range, and in BSQ [t(82)=- 2.355, $p<0.05$].

DISCUSSION

Generally, our findings support those of other research studies and stress out the same concerns about these particular patients. Despite the similar age and BMI, binge patients differed significantly in some eating symptoms, attitudes (Kalarchian et al., 1998; Wilson, Nonas, & Rosenblum, 1993) and common comorbidities (Bulik et al., 2002; L. Hsu et al., 2002).

The presence of highest eating disorders' symptomatology and attitudes found in the BED, as well as a greatest fear of gaining weight and the report of highest influence of weight on daily life, suggest that the psychopathologic core of Eating Disorders might be present in these patients and distinguishes them from their non-BED counterparts. Other studies found similar results (L. Hsu et al., 2002; Wilson et al., 1993).

Wilson and colleagues (1993), found a higher level of eating disturbance and body dissatisfaction in the BED group and Hsu and colleagues (2002) found the eating and shape concern subscales, as well as the global EDE score, to be significantly highest in the BED patients.

Despite these concerns regarding shape, food and weight, groups didn't differ in the restraint subscale. This might suggest that these patients, after several unsuccessful attempts to lose weight, common in obese individuals, give up on dietary rules and dietary plans. Nonetheless, the binger group seems to be significantly more distressed with weight issues.

In addition, the BED group scored within the clinical significant range in EDE total scale and very high on weight concern, shape concern subscales. These scores are close to those of patients with Bulimia Nervosa. Similar results were found by Marcus et al. (1992) when comparing obese BED patients before starting weight loss treatment with normal weight Bulimic patients and found that obese binge eaters obtained EDE subscale scores that did not differ from those reported for normal weight bulimia nervosa patients on the Overeating, Shape Concern, Weight Concern, and Eating Concern Subscales of the EDE.

Binge eating patients also reported highest degree of psychological distress (OQ45) and depressive symptoms (BDI). Again, these levels are similar to those found in BED patients, suggesting that the common comorbidities and psychological distress associated with Binge Eating Disorders (Sarwer, Wadden, & Fabricatore, 2005; Wilson et al., 1993) also distinguishes the two groups in our sample.

Our results suggest also that eating disorders and depressive symptoms might be related, and that the depressive symptomatology may be mainly due to the dysfunctional eating patterns and influence of weight in everyday life (Bocchieri et al., 2002), since it is most relevant in the BED group (Bulik et al., 2002; Herpertz et al., 2004; Powers et al., 1999; Telch & Agras, 1994).

Given that depressive symptoms and emotional eating (Green et al., 2004) seem to be related and associated with poor outcomes (Delin et al., 1995) and worst compliance to treatment (Averbukh et al., 2003; Herpertz et al., 2004), these results indicate that eating symptoms and related comorbidities should be taken into consideration in weight loss surgery treatment.

Additionally, the increased impulsivity scores related to actions in the present (motor - acting without thinking; cognitive - quick decisions), found in BED patients might be related to the difficulty to refrain the impulse to eat, leading to binge eating behaviors. This comes close to the positive correlation found between Impulsivity and several eating behaviors (Nasser, Gluck, & Geliebter, 2004), and the association between impulsivity and elements of BED status, that relates to poor outcomes after surgery (de Zwaan et al., 2002; Pessina et al., 2001).

Though the eating symptomatology might change after-surgery and objective binge eating episodes may disappear (Bocchieri-Ricciardi et al., 2006), patients with a cluster of Eating Disorder's symptoms seem to have poorer outcomes and enroll in either maladaptive behaviors or don't comply with the nutritional prescriptions.

As the presence of these clinical symptoms might compromise the success of the bariatric surgery interventions (Bocchieri et al., 2002; Larsen et al., 2004; Sallet et al., 2007), it is important to consider the need for a specific and targeted intervention protocol, focused the problems that might persist after surgery.

This should be a step further to enable clinicians to predict which patients might have poorer outcomes after surgery and the dysfunctional eating behaviors that might persist after surgery, compromising outcomes.

Future research should aim at investigate the patient's features that best fit the different surgical procedures, in order to provide an individually tailored treatment, directed to the needed behavioral adaptations.

Another relevant issue is the importance of better understanding the eating patterns in obese patients. Other studies (Marcus, Smith, Santelli, & Kaye, 1992)stressed out that Binge Eating in Obese patients seems to have different features than in the normal weight Bulimics. For this reason, research should focus on specific eating patterns and common features associated in this population.

Limitations of this study included the fact that "Grazing" in not currently defined with precise and consensual criteria, particularly for time frame and behavior frequency per week, which is central to understand and identify this maladaptive behavior.

The fact that we decided to use a modified criteria for Binge Eating as compared to the one proposed in DSM-IV, enable us to assess the impact of this cluster of Eating Disorder (ED) Symptoms but doesn't allow to understand if the full diagnostic criteria (including only objective binge eating episodes twice a week) would have a different impact in the results. However, since BED is still an Appendix of DSM-IV under study, future studies might need to evaluate the difference between the two groups.

In summary, our study emphasizes the distinctiveness in terms of comorbidities of the binge eating patients and the need to consider both ED symptomatology and psychological distress in the subgroup of obese patients candidates for Bariatric Surgery, in order to enhance therapeutic outcomes.

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CHAPTER II

Group Preparation for Bariatric Surgery

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Abstract

Bariatric surgery requires a substantial amount of change in life-style and should imply an informed decision making process, as it is important that patients understand the requirements and specificities of treatment process, taking responsibility for outcomes and taking an active role in the treatment process. In this chapter, we describe a psycho-educational program for group preparation for bariatric surgery, exploring the structure of the program and main objectives. Further details are given for specific objectives and task for each session. Preparation is crucial for a life time surgery intervention, continuous and long-term monitoring is imperative to prevent weight regain.

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INTRODUCTION AND TREATMENT CONTEXT

Bariatric surgery is the treatment of choice for morbid obesity. However, individual patients' outcome is not uniform (L. K. George Hsu, Peter N. Benotti et al. 1998), and despite several efforts, the literature psychological predictors for bariatric surgery success is far from conclusive (Gerbrand C. M. van Hout 2005; Lindsey E. Bocchieri-Ricciardi, Munoz et al. 2006; Gerbrand C M vanHout, Christine A J M Hagendoren et al. 2009; Paulo C. Sallet, Eliane Collis et al. Obesity Surgery).

Although research is not clear about the impact of pre-surgery eating disordered patterns on treatment outcomes (James E. Mitchell, Burgard et al. 2001; Saunders 2001; Lindsey E. Bocchieri, Marta Meana et al. 2002; Sara H. Niego 2007), weight regain after surgery seems to be, as expected, associated with dysfunctional eating patterns and failure to comply with nutritional guidelines and prescriptions(Norman A. Poole and Fiennes 2005). In fact, postoperative but not preoperative Loss of control is of predictive value for weight loss (Ramona Burgmer, Katrin Grigutsch et al. 2005; Marney A. White, Melissa A. Kalarchian et al. 2010), as eating patterns seem to change dramatically with surgery and new maladaptive eating problems might emerge at post-surgery (Lindsey E. Bocchieri, Marta Meana et al. 2002).

As discussion about patients' selection criteria and the role of psychiatric disorders as contraindication for surgery is still far from consistent, the medical guidelines prevail in selecting patients for surgery.

Nonetheless, bariatric surgery should imply an informed decision making process, as it is important that patients understand the requirements and specificities of treatment process, taking responsibility for outcomes and taking an active role in the process (Agnieszka H. Dziurowicz-Kozlowska 2006).

Bariatric surgery requires a substantial change in life style (L. K. George Hsu, Peter N. Benotti et al. 1998). Patients should be conscious regarding difficulties and particularities of the treatment as physical changes, required adaptations in their daily life, and for how long they will have to keep these changes. Patients have to commit to significant changes in lifestyle and it is crucial for them to acknowledge their responsibilities in the process.

Our group has been developing a pre-surgery intervention aimed at preparing patients for the surgical process, supporting them to make an informed decision, and training skills that will help them cope with the post-surgery demands, by informing about the surgery process and enlightening the implications of treatment in different aspects of life. A CBT approach is used in this psychoeducational program.
The main goals of the program are to 1) inform the patient about the different surgical procedures; 2) inform about life style changes required after surgery; 3) actively involve the patient in the treatment process; 4) increase the participant's sense of responsibility for the treatment outcome; 5) increase motivation for treatment; and, 6) prepare participants for the recovering period and post surgical changes.

Although some weight loss and change in eating behavior might be observed due to some life style changes, this program is not designed for weight loss, improving of self-esteem or treating psychopathologic symptoms (e.g., low-self-esteem, loss of control over eating behavior, depressive or anxiety problems). Most of these aspects should be addressed post surgically for those patients in need.

Since patients will go through an extreme amount of change during the first year, we believe some problems should only be addressed after surgery, and should not be included in a preparation program for surgery.

For the purpose of this chapter, we have decided to share our views on the guidelines and main objectives in preparing patients for bariatric surgery, as well as discuss particular concerns or difficulties in dealing with this specific population.
We assume that there is a big variability of valuable strategies in addressing particular therapeutic objectives, and for this reason we will not go into much detail regarding the activities/tasks.

TO WHO DOES THIS PROGRAM APPLY?

All participants in the current program had already been screened and cleared by different medical specialties (e.g., endocrinology, surgery), including a psychiatric evaluation to screen for major psychiatric illnesses. However, it is common to find patients with mild psychiatric symptoms (e.g., depression, anxiety).

The program is open to any participant who is able to undergo an informed decision. We have found that participant with mild depressive symptoms, anxiety and loss of control over eating are usually very involved in the program and seem to benefit from it.

THE STRUCTURE OF THE PROGRAM

The program was developed in a group format, to allow discussion and sharing of experiences and knowledge. It is suitable, however, for individual intervention, as the

main objective is to help participants make an informed decision and the activities are mostly individually based.

We run the sessions in small groups (N=5/6) to assure that all are able to get involved in the group activities. We have been discouraged by big groups because, in our experience, these patients seem to be extremely enthusiastic about sharing personal opinions and experiences in a group where being extremely overweight is regarded as normative.

Therapists provide a relaxed and supporting environment and find time for participants' questions and doubts. Most of the participants tend to be misinformed about the surgery and it is crucial that they are open about their doubts, fears and expectations. .

Before entering the group, participants are interviewed by a trained therapist in order to collect their personal history and gather information that might not be disclosed in a group session. At the end of the first session, a small introductory pack of the program is delivered to each patient to keep for future reference, that includes general information on the structure of the program itself, obesity, weight and BMI, exercising and regular body weight-ins.

Participants are also asked to keep a food diary that should be delivered in the following session. This activity usually gives the therapist unique and valuable information on individual eating patterns.

We offer monthly sessions to participants. Each session lasts 90 minutes and is divided in two parts: 1) brief individual assessment of weight and discussion with the participants about changes in weight and difficulties felt between sessions (30 min); 2) group session focused on a different topic each month. (1 hour).

The thematic sessions begin with the mostly behavioral topics in order to encourage initial change in life habits (Eating behavior; Physical activity), followed by the mostly informative (Obesity surgery), and the topics that includes a higher cognitive component (Obesity surgery; Goals and expectations; Self-concept and self-care). The last session (Social support and significant others) is a motivational and supportive session involving the basic support system.

DESCRIPTION OF THE SESSIONS (note APPENDIX I)

1) Eating behavior – Promoting adequate eating behaviors

The goal of this session is to educate participants about healthy eating habits, strategies to have a controlled eating pattern and reduce behaviors that tend to increase daily caloric intake (such as grazing, skipping meals, etc). We address some of the most common eating problems and highlight strategies that will help the participant to comply successfully with the post-surgery nutritional plan. The pre-surgery period should work as a practice time for a healthy eating style required post-surgically, and participants are encouraged to identify their own maladaptive eating behaviors and start improving their eating pattern. This session explores general guidelines for dysfunctional eating problems and is not directed for pathologic eating behaviors (eg. binge eating).

A) Relate weight regain with energy intake-expenditure balance

General information on weight and weight loss is provided initially. Although body weight can be influenced by several factors (e.g, genetic, biological, social, psychological, etc.), ultimately body weight (loss and gain) is the result of the

dynamic balance between energy intake (caloric consumption in food and drinks) and energy expenditure (psychical activity, daily activities or even body functions)(Grilo C 1993). This means that, in order to lose weight, the amount of energy spent has to be superior to energy intake. Thus, weight loss can be achieved either by decreasing caloric intake or increasing body activity.

This session' focus is in the intake side of the equation, i.e., in adapting eating behaviors in order to reduce caloric intake.

Some of the most common myths related to eating and obesity emerge in the discussion and should be clarified.

B) *Identification of overeating*

Overweight is a result of several factors, but it usually includes some kind of overeating. The goal here is to address the most common ways of overeating, in order to help participants identifying the maladaptive behaviors that they are more prone to engage in.

We discuss three categories of overeating: a) "binge eating": presence of loss of control over eating; b) "grazing": eating in an unplanned and repetitive way along the day; c) food choices and eating patterns: caloric food choices, having few but large meals during the day, etc.

Participants are asked to think about these issues using a list of questions that help them understand their persistent eating problems. They are asked to think about why they feel it is so hard to follow the nutritional plans, which eating habits are more difficult to avoid or to resist to; which are the types of food they eat most frequently, in what situations do they eat the most (either in their daily routine or in emotional situations), etc.

In our experience, it is common for participants to argue that they follow all the nutritional rules and never overeat. When this happens, we focus on the need to work on the other side of the energy balance (spending energy). However, we still remind them that surgery will change eating habits and that they should be prepared to identify them if they emerge after surgery(Lindsey E. Bocchieri, Marta Meana et al. 2002). We also ask participants to identify the most common eating problem in significant others and in those with whom the participant usually have meals. They, frequently, engage in the same behaviors without noticing, particularly when they are not responsible for food preparation.

Based on their food diaries we ask them to identity problematic eating behaviors out of a list that includes several examples of maladaptive eating behaviors related to a) when they eat (e.g. "I only have one meal (dinner) a day"; b) how much (e.g."I usually have a second helping"), c) what ("I drink caloric drinks very often") and d)how (e.g."I always eat in a hurry and very rapidly") they eat.

C) *Educate about strategies for reducing daily caloric intake*

After identifying the most common eating problems we discuss a list of general strategies that might help them improve their eating style and cope with some of the identified problems. Practical tips are given on how to eat slower; how to eat an appropriate number of times per day; how to avoid grazing or nibbling; how to successfully finish a meal; how to better enjoy the meal and how to control food availability.

It is also very important to learn to eat in response to physical hunger and not in response to other situations, such as emotional distress, food availability or boredom. Eating should happen when one feels hungry, and a meal should be

terminated in response to satiation. However, very frequently, overweight people report that they eat for reasons other than hunger, and that they stop eating when they feel physical discomfort. Identifying physical hunger is, thus, an important skill to learn.

Participants are educated about initiation and termination of a meal by exploring feelings associated with physical hunger and satiation, to avoid feeling "starving" or "completely stuffed.

At the end of the session, each participant should be able to identify maladaptive eating behaviors, and should have selected a number of strategies to start implementing to improve eating patterns.

2) Physical exercise - Promoting active life style

More than promoting an healthy and active lifestyle, the aim of this session is to educate about different ways of exercising, particularly focusing on the distinction between "physical activity" (being active in daily life) and physical exercise (structured physical activities such as gym, and team sports). The focus is on thinking actively and increase the energy consumption in body functioning.

A) Educate about the importance of physical activity after surgery.

In our experience, misconceptions about physical exercise are common. Some participants have tried to exercise in the past without a positive impact on weight; others think that only strenuous exercise can help them. Generally a sense of low

self-efficacy about exercising and low motivational levels towards physical activity tends to promote a sedentary life (Biddle SJ 1998 ; Junilla K. Larsen 2006).

Physical exercise should not been seen as a way to compensate for the amount of food ate but should be part of an active and healthy life style.

Exercising and keeping an active life style is crucial for surgery outcomes in losing weight and maintain the weight loss at long-term(Barbara Metcalf 2005).

Participants have to be aware that exercising should be part of their lives and should start considering time for it.

B) *Distinguish between physical exercise and physical activity*

Having an active lifestyle does not always imply structured physical exercise. In fact simply by being active, body activity will increase leading to a higher caloric expenditure. For a sedentary person this should be the first step: to think actively - activate mind and body to act and react in daily live.

On other hand, aerobic exercising improves the cardiovascular condition, which implies increased heart rate, breathing and blood circulation. These activities improve cardio-respitatory ability; strengthen heart and lungs' function and promote caloric expenditure. This type of activity is crucial for maintaining weight loss.

C) *Identify strategies to increase physical activity*

Participants are encouraged to estimate their own activity level, by calculating the number of hours that they spend being inactive, or being active and exercising. Then, strategies to increase each participant activity level are discussed, and barriers to physical activity are identified. Participants are lead to consider issues around

what, where and when they rather exercise, and how, with whom and how frequently is it viable to plan doing it.

Since it is important to keep active throughout the years, and not only while they are losing weight, they should also consider and prepare to barriers in the near future, such as changes in weather, jobs or family structure.

By the end of this session participants should understand the difference between physical exercise and physical activity. They should be prepared for barriers to exercising, as well as have a plan to start implementing on their daily life to increase physical activity.

3) Obesity surgery - Educating about surgical procedure and post-surgery implications

The goal of this session is to educate patients about the surgical procedures and its short, medium and long term implications. Preparation for surgery includes understanding every step of the treatment, which, in bariatric surgery, is a process from the recovering days to the long-term commitment to a new lifestyle. It is important to acknowledge the different surgical procedures and its possible outcomes or complications, in order to make an informed decision. After surgery, it is common to have patients blaming the type of surgery for poor outcomes, instead of realizing that they might be engaging in maladaptive eating patterns. It is important to provide reliable information and to check the information that participants might have from less reliable sources

In this session, we want to clarify the role of surgery in weight loss for each surgical procedure, while emphasizing the individual responsibility for "helping surgery work".

A) *Educate about different surgical procedures*

Relying on "gastric models" and images, each surgical procedure is explained. Participants are informed about implications during surgery, recovering time, amount of weight loss, requirements after surgery, common problems associated with eating, and other relevant information.

It is crucial that each participant understands why they are undergoing a certain type of surgery, and that their decision is based on their individual characteristics and the features of each surgical procedure.

B) *Tips for the pre-surgery and preparation for post-surgery time*

Patients are encouraged to consider practical issues in the days immediately pre and post surgery, as well as considering the changes they will have to keep at long-term (e.g., start exercising, shop for different food items, planning meals ahead).

It is also important to think about activities and duties they will not be able to perform during recovering time, as well as informing those implicated in these activities.

Often participants are not aware that they will have to take a break from the daily routine because of the implications of surgery. Also, they should be alerted about the number of expected recovering days at the hospital and the physical discomfort associated with surgery.

C) *Common problems after surgery: maladaptive behaviors vs. healthy behaviors*

With extreme change of eating patterns some problems might emerge due to maladaptive eating. It is important to know how to deal with issues such as spontaneous vomiting, to certain types of foods' intolerance, dumping or plugging. Usually, we help them seeing these problems as alarm signs from their body, indicating that they are not eating properly. Patients might need to eat slower some kind of foods, to take more time to eat, or to avoid long periods of time without eating. One way or the other, the participant should pay attention to these signs and use them to "re-learn" about how, what and when to eat.

They should know that it is normal for these problems to occur after surgery or when they try new foods, but it is not normal if they keep occurring.

It is also important to discuss some maladaptive eating behaviors that might increase the caloric intake after surgery such as highly caloric beverages, eating food that easily passes through the gastric band (when applies) , or persistently eat until they feel physical discomfort.

Finally, we summarize healthy practices that are usually related to better surgical outcomes (e.g., frequent exercising, regular eating, healthier food choices).

D) *Inform about cosmetic surgery after bariatric surgery*

Many questions usually rise regarding extra loose skin after surgery and women usually report feeling very dissatisfied with sagging skin of the breasts. These issues should be briefly discussed and participants should be informed that the best time to undergo cosmetic surgery is when they reach a stable weigh. Given that weight tends to vary at two years of follow-up, one should be cautious about esthetical surgery before that time, which means that they will have to deal with the extra

loose skin for a significant period of time, that might generate unsatisfactory feelings (Mitchell, Crosby et al. 2008; David B. Sarwer 2008).

At the end of this session participants should understand the implications of surgery and be prepared for the recovering period. Participants should also be aware of problematic eating issues related to surgery that might relate to dysfunctional eating and increased caloric intake.

4) Emotions, Stress and Eating - Understanding the relationship between emotions and eating

Overweight people often report eating or overeating in emotional situations. This occurs most frequently with intense emotional events, described as the most difficult to deal with, but also when feeling bored, relaxed or happy and in pleasant social situations with friends.

In this session we focus on coping with these emotional situations, explain vicious cycles that maintain the behavior and explore alternative coping strategies that do not include food and eating.

Patients usually find their own reasons for overeating. They frequently mention that eating is the only way to calm down and fell some comfort, some believe that food is a way to fill a "sense of emptiness", others might say that food is the only company. These reasons are often used to explain the relationship they have developed with food along the years.

One of the aims of this session is to challenge these preconceived notions about the role of food. Without denying the reinforcing and pleasant role of food in our daily lives, we

help them understand that eating might have become the default response to stressful or emotional events, as a learned behavioral response. We find this way of looking at the emotion-eating relationship empowering to the participant. Giving this framework, we discuss alternatives ways to cope with emotional situations and educate about how to eat in response to physical hunger and not emotional states.

A) Educate about emotional stress

We start with a brief explanation about the dynamic relationship between thoughts, feeling and behaviors. The main point is to help participants understand that what they think about a particular situation, influences the way they feel, and behave in response to that situation, and this cycle tends to be perpetuated and reinforced.

Thus, emotions (e.g., stress, happiness, boredom) are related to what we think about situations, and usually trigger a certain behavior (such as eating). Changing one of these three components will change the way one reacts to emotions.

B) Educate about "emotional eating"

As mentioned before, some patients tend to eat when they are feeling specific emotions, such as frustrations, sadness, anxiety or boredom. Eating is the behavioral response they have learned and its role in soothing unpleasant emotional states is unquestionable. In fact, the brain neural reward system is known to be activated during eating, and pleasant feelings are often associated with some types of foods (Kelley 2004; Stoeckel, Weller et al. 2008).

In other words, eating is the behavioral response to the emotional state that was, most probably, learned through experience.

C) Identify emotional situations related to eating

Based on the food diaries and on their own experience, participants are asked to identify emotions associated with eating, and to understand the role they have been giving to food and eating. They are encouraged to question their eating habits, for example: a) Do I eat when I have nothing to do? b) Instead of shouting and get irritated with someone? c) When I am sad or feel lonely? d) Do I eat to take a break during the day?

D) Identifying strategies to deal with emotional hunger

The distinction between physical hunger and emotional hunger (discussed on a previous session) might help some participants detect situations where they start eating for other reasons than "real" hunger and activate some of their personal strategies.

Based on a worksheet participants detect the situations where they are most prone to eat without feeling "real hunger", and strategies to deal with different situations are discussed: 1) reappraisal of situations (thoughts) and change thought and feeling about a situation; 2) change the way they react (behaviors) to a situation: for example dealing directly with the problem when feeling emotionally distress; 3) change environment (food availability), 4) get involved instead of getting bored.

By the end of the session participants are expected to have a better understanding of the role of eating in coping with difficulties, and to have identified emotional situations where they are most likely to overeat, selecting a list of alternatives to prevent the situation or to deal with it without eating.

5) Goals and expectations - Promoting realistic goals and expectations about surgery outcomes

In order to keep patients motivated throughout the post surgical period it is important to set realistic expectations, not only regarding expected weight loss, but also related to changes in daily routine and life in general(Gerbrand C. M. van Hout 2005). For example, a patient might remember a period of his/her life when weight was within normal range, but he/she was also younger, had different jobs, or other social and family responsibilities. Other might idealize about becoming a totally different person after losing weight, believing that life will be much better after surgery. Some, even think that the surgery is the magical solution that will work by itself, and that efforts to lose weight area something from the past. Our job is make these expectations realistic, possible to achieve, and real, operating in their ongoing real live and in result of their own efforts, and not just as a consequence of weight loss.

These expectations should became realistic (possible to achieve) and real (operating in their ongoing real live), as a result of their own efforts and not just as a consequence of weight loss.

A) Educate about the importance of realistic expectations

To know what to expect is the best way to avoid frustration in the process of change. On other hand this helps to assess the changing process and understand if one is where he/she should be, or whether additional help is needed to obtain successful outcomes.

Different types of changes will occur. Some will be, indeed, directly related to the weight loss (such as mobility, feeling more energetic), some will require additional effort and planning (e.g., regular eating, different food selection, more exercise).

Again, these changes are to be effective and need to be incorporated in a new lifestyle.

Rate of weight loss is an important issue and can be stressful, as patients do not lose weight at the same rate in the post surgical period. After the initial weight loss patients tend to feel anxious about losing little weight per month and want to keep their weight loss rate "high". It is also important to discuss how long it is expected to take for them to achieve their target body weight, that weight loss is an individual process, and their aim is to achieve their best weight at long term and maintain it.

B) *Identify individual meaning of success and failure*

It is very important to understand what the meaning of success for each participant is, and what they expect to get in order to consider the surgery worthwhile. We encourage them to think about indicators of success, about what they expect to be or feel, what things they will do differently, what things they do that they are not doing or how will they know they "got what they were looking for".

C) *Establish personal realistic expectations*

Each participant, and depending on the elected surgical procedure, will think about that he/she consider to be the ideal weight, the acceptable weight and the weight that they feel too high. These are to be discussed based on the expected amount of weight loss for the individual conditions.

Participants are expected to write down a list of realistic goals and expectations for different "areas of life": weight loss; eating, exercising; self-worth, family role, social roles; professional live, others.

Since they have to commit to a different life-style we encourage them to establish rewards for their little-step successes.

At the end of this session participants should be more informed about what they can realistic expect from surgery in regards to weight loss and changes in the different aspects of live. They should also think thoroughly about the meaning of success and decide a way of rewarding each milestone.

6) Self-concept and self-care – working the self-worth system

With weight loss patients will probably feel better about their own body image and excited about other people compliments. Continuous reinforcement by others and significant changes in appearance due to weight loss might put a big amount of attention on body image and, sometimes, drift the attention from other important aspects of their self-worth system.

We think it is important to work on a personal system value that is not exclusively based on valuation of body image to judge self-worth.

It is important for bariatric surgery patients to realize that they can start feeling better about themselves regardless of their weight loss. Other aspect of their image and of their life should be nurtured as they should understand that a better self-esteem and self-concept does not only involve losing weight and can start to be enhanced right before the surgery.

Instead of working directly on improving body image, and since we work with an heterogeneous group and not all participant have a negative body image, we find useful to focus on self–concept instead, and alert for the impact that body image might have.

A) *Understand the main aspects to incorporate the individual self-worth system.*

We first present the concept of self-worth evaluation system and discuss some examples of other persons. We include Significant Others, persons that they admire and that they dislike, public figures and idols or idealizations. This will help us alert for the fact that very often, the way people evaluate themselves is significantly different from how they evaluate others. This activity also makes clear that weight is almost never mentioned when evaluating how they feel about others.

Based on a worksheet we ask the participants to draw slices on a pie graphic figure corresponding to the aspects of their life that they use to self judge. The variability and size of the slices are discussed and participants are encouraged to think about what they are good at, what other like about them, etc.

B) *Educate about Body-image and self-concept*

Despite the effort to expand self-worth system, body image plays an important role in the mental image of the obese patient(Lindsey E. Bocchieri, Marta Meana et al. 2002). Body image is a result of multiple factors: developmental issues, past experiences, present environment, time of the year and so on. Actually, it is easy to realize that how they feel about themselves regarding their body figure varies depending on what one is wearing (tight clothes might make one feel fat), how much one ate (feeling stuffed usually trigger bad feeling about body shape) or time of the year (hot weather and little clothes makes one more aware of lumps increases body exposure). However, surgery might generate other concerns about body shape as extra hanging skin, and loose lumps might generate feeling of unattractiveness(Mitchell, Crosby et al. 2008).

These feelings might have a huge impact on how one feels about his/hers personal value and it is important participants understand that how they see themselves (their internalized image about body appearance) can vary with things they do in their daily life, and that sometimes "feeling fat" depends more on things they do than in being overweight.

C) *Educate about body checking and "feeling fat"*

With support of a worksheet participants are encouraged to make a list of things that makes them "feel fat" and "feel good" about their appearance. The concepts of body checking and weight avoidance are discussed during this activity as attempts to control or avoid body image. These behaviors usually lead to bad feelings because they focus the attention on unsatisfactory body parts increasing preoccupation and anxiety about them.

By the end of this session participant are expected to understand that body image is a manageable concept, and that self-worth depends on many other things than weight body. Finally participants are asked to think about small things that they can start doing to feel better, to enjoy and to care about themselves.

7) Social support and significant others - Promoting adequate social support system

In this session we invite significant others (S.O.) to participate. Very often we find out that S.O. do not support the decision of undergoing surgery and are not sensitive to the details of the procedure. Nonetheless, these persons usually influence the change

process. S.O. may facilitate adaptation to a healthier life style or, if not supportive it might hinder the process.

It is not always easy to find S.O. with availability to participate in the session, nor it is possible to have all S.O. present. Nonetheless, the participants are expected to identify the people that might help in the process, or those who might create challenging situations and tell them how they can help.

A) *Address possible impact of surgery on others (e.g. family, work colleagues).*

During the recovering period, S.O. might have to be responsible for some tasks that the participant will not be able to do, and it is very important the they are prepared in advance for this to avoid stressful situations.

Moreover, some patients will find that they need to re-structure their daily routine in order to accommodate other eating pattern and exercising activities, which might impact the family routines as well.

If, in other hand, patients opt to change on their own (for ex. preparing his/hers own meal), S.O. must be supportive and avoid tempting him/her with challenging situations.

It is also crucial to inform S.O. about how long the different changes will need to be kept.

B) *Clarify Significant Other's (S.O.) remaining doubts regarding surgery*

It is important for S.O. to be aware about the importance of undergoing surgery, to clarify their own myths (usually based on unreliable information), and to emphasize the importance of their role to the successful outcomes.

C) Educate about helping the participant adapt to a new life and eating style

We expect that patients (and S.O.) have decided on who is identified as S.O. and what role this person will have in the treatment process.

By the end of this session participants should have identified the persons that might help during recovering time, foresee possible challenging persons, and decide on how to react to them. Participants should also plan on informing the most involved persons regarding the changes surgery requires.

CONCLUSION

In an environment with limited resources, a stepped-care approach is the most reasonable choice to deliver the adequate amount of help to each patient (Haaga 2000). Given the variability in the individual trajectories and outcomes, the extreme change in eating patterns and possible eating problems, and the inconsistent findings regarding psychological predictors of success or treatment failure, it seems that the post operative behaviors are the strongest predictors of treatment outcome. However, bariatric surgery requires and important commitment to a lifetime change that should go through an informed decision making process, in which preparation is crucial. Nonetheless continuous and long-term monitoring is imperative, and systematic follow-up should be highlighted in the treatment process to continuously detect problems and prevent weight regain.

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CHAPTER III

Obesity Disordered Eating Questionnaire - ODE: a Self-Report Measure for Dysfunctional Eating in Obese Patients Undergoing Bariatric Surgery

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Abstract

BACKGROUND/OBJECTIVES: Although obesity is commonly associated with the presence of eating disorders (ED) symptoms and shares some cognitive features with ED, obese patients show specific maladaptive eating patterns that lead to overeating. Up to date, there is no self-report measure designed to address the specific eating patterns common in the obese population and questionnaires developed to ED patients are often used. We have developed a self-report questionnaire (Obesity Disordered Eating Questionnaire – ODE-Q) based on Eating Disorder Examination Questionnaire (EDE-Q), that addresses eating disorders symptomatology, as well as loss of control and other maladaptive eating behaviors common in obese persons. This study intended to examine the psychometric properties of the ODE and test its utility to screen for dysfunctional eating behaviors.

METHODS: ODE was administered to 130 obese patients undergoing bariatric surgery, pre or postoperatively. Psychometric characteristics were analyzed and scores compared to the EDE interview.

RESULTS: The scale possessed good reliability (alpha = 0,855) and convergent validity, with 36,487 % of shared variance between EDE-Q and ODE. Individuals with eating disorders identified by ODE presented elevations on validated measures of eating disturbances ($t(105)= -5,49$; $p<0,001$) when compared to controls. The scale

significantly distinguished between the EDE-identified binge and non-binge group, suggesting good discriminant validity. Criterion validity was fair with k values ranging from 0,22 to 0,41, but prediction coefficients suggest that ODE is a good screening measure.

DISCUSSION: ODE showed to be a good self-report questionnaire to evaluate ED common clinical features and useful to screen for dysfunctional eating behaviors.

KEY-WORDS: Eating patterns, obesity, self-report measure.

Background

Bariatric surgery has been associated with significant improvement of obese patients in weight and several other psychiatric characteristics such as depression, social functioning, quality of life, self-esteem and eating patterns (Bocchieri, Meana, & Fisher, 2002; S Herpertz et al., 2003). However, a considerable variability in outcomes led clinicians and researchers to investigate the factors that compromise or enhances outcomes (van Hout, Verschure, & van Heck, 2005). Several psychological characteristics have been associated with poor outcomes, but special attention has been paid to binge eating disorder and other maladaptive eating behaviors, as they seem to play an important role in weight regain and weight loss after surgery (S. Herpertz, Kielmann, Wolf, Hebebrand, & Senf, 2004; L. K. George Hsu et al., 1998). In fact, despite not being considered an Eating disorder, Obesity is often associated with disordered eating, and the prevalence of binge eating in this population has been estimated to be from 10% to 69%, depending on the type of measure used (Spitzer et al., 1992). In bariatric surgery, several studies have shown that patients who develop binge eating disorder (BED) after surgery, tend to regain more weigh (Colles, Dixon, & O'Brien, 2008; L. K. G. Hsu, Sullivan, & Benotti, 1997; Mitchell et al., 2001), and that the presence of maladaptive eating behavior, such as night eating (Allison et al., 2006), grazing (Colles et al., 2008; Saunders, 2004) or emotional eating (Fischer et al., 2007), and loss of control (White, Kalarchian, Masheb, Marcus, & Grilo, 2010) are related to poorer outcomes in surgical treatment. Also, despite the diagnose of BED in obese patients not being as clear as it is for Bulimia Nervosa (BN) patients, some authors (Niego, Pratt, & Agras, 1997) suggested that binge eating should be considered as loss of control rather than quantity of food. In obesity, binge episodes are known to be difficult to assess, since they are not as distinctive as in BN, where they are usually

clearly initiated and terminated with intense feelings and/or some kind of compensatory behavior (Martina de Zwaan et al., 2004; Marcus, 1997). Nonetheless, obese patients undergoing bariatric surgery and reporting loss of control over eating seem to share with eating disordered patients the psychological core of eating disorders (ED), presenting most dysfunctional attitudes and concerns regarding eating, weight, shape, and most psychosocial distress. These clinical features might make them prone to disordered eating after surgery and in need for ongoing monitoring (M de Zwaan, 2001; L. Hsu et al., 2002).

These data highlight the need for assessing eating behavior in bariatric surgery patients, both at pre and post surgery times, since preoperative and postoperative eating patterns might represent potential predictors for treatment outcome. Thus, in order to identify eating-related pathology in obese patients undergoing bariatric surgery, self-report measures developed and validated for eating disordered patients have been extensively used. As interviews are often considered to be the most rigorous method, they require expertise and extensive training to be administered, they are usually very time consuming, and their utility in these settings is limited (Grilo, Masheb, & Wilson, 2001; Kalarchian, Wilson, Brolin, & Bradley, 2000).

The Eating Disorder Examination (EDE) (Fainburn & Cooper, 1993) is a semi structured investigator-based interview currently regarded as the gold standard method to capture eating related psychopathology, ED symptoms and frequency of disordered eating behavior. The EDE-Q is a self-report measured developed directly based on the EDE and the most commonly used in research. However, it is not clear whether this measure is suitable for obese patients undergoing bariatric surgery, and particular during the post-op time when the inability to eat “large amounts of food” and the required “restraint eating” should be considered as normal. One study that investigated the

psychometric performance of EDE-Q in bariatric surgery candidates (Hrabosky et al., 2008) concluded that the scale does not represent the same eating disorders factor structure in this population as they couldn't replicate the same four subscales found originally in bulimic patients. Another study that compared the performance of the EDE and EDE-Q concluded that despite being an adequate measure for the psychological features of Eating disorders, EDE-Q has limited validity when detecting binge eating in the bariatric surgery population (Martina de Zwaan et al., 2004). Other eating disorder questionnaires have been cited in the literature (BITE – Bulimia Investigatory test, Edingburg (Henderson & Freeman, 1987); BES – Binge Eating Scale (Gormally, Black, & Daston, 1982); TFEQ Three Factor Eating Questionnaire (Stunkard & Messick, 1985); EDI – Eating Disorder Inventory (Gardner, Olmstead, & Polivy, 1983), QEWP-R – Questionnaire of Eating and Weight Patterns Revised (Spitzer et al., 1992, 1993). However, these too were developed based on features presented by eating disordered patients and the ability to assess ED and binge eating symptoms in obese patients is still questionable. Also, although obese patients share some traits with ED patients, these measures do not seem to address particular maladaptive eating behaviors commonly present in obese patients.

The excessive weight in obese people is not always related to the presence of an ED diagnose (such as BED or BN). However, other maladaptive eating behaviors such as loss of control and grazing behavior are common, and result in excessive caloric intake (Colles et al., 2008; Saunders, 2001). Moreover, in obese patients undergoing bariatric surgery, research has shown that eating behavior tends to change at post-op, and new behaviors might appear. The presence of plugging, vomiting and dumping syndrome might also suggest problematic eating (Pessina, Andreoli, & Vassallo, 2001). Moreover, it seems that both excessive weight and weight regain after surgery, might be

related to maladaptive eating patterns. Obese patients frequently report grazing behaviors along the day (Saunders, 2004), loss of control over eating specific types of foods (eg. sweet and soft foods), or even not having regular eating patterns or going a long time without eating, ending up overeating during meals (S. Herpertz et al., 2004). In bariatric surgery, we also know that the weight regain at post-op is mainly due to failure in following the prescribed diet, being the quality and quantity of food eaten not adequate.

To the best of our knowledge, there still is not a self-report measure that addresses specific eating behaviors and eating patterns in obese patients, that should be considered as they might have impact on treatment outcomes. Thus, the specificities of the disordered eating behavior in obese patients, particular those undergoing bariatric surgery, seem to have been systematically neglected when screened by measures developed for ED patients (L. K. George Hsu et al., 1998; Kalarchian, Wilson, Brolin, & Bradley, 1998). ODE aims to address the particular maladaptive eating behaviors and eating patterns of obese patients, particularly those undergoing bariatric surgery. The purpose of this study was to test psychometric properties, examining its reliability, criterion and construct validity of this new self-report measure for dysfunctional eating.

Methods

Participants

Participants were 130 caucasian obese patients (13,1% male and 86,2 % female) undergoing bariatric surgery treatment in two main hospitals from the North of Portugal. Pre-surgical patients were evaluated the week before surgery, but post-surgery participants varied in follow-up time from 0,8 up to 11 years after surgery. BMI ranged

from 25,55 to 59,56 (M=41,69 ; SD=6,31). At pre-operative time mean BMI was 43,5 (SD=5,24), and post-surgical patients presented mean BMI of 35,12 (SD= 49). Sixty four (48,5%) of the patients had a basic educational level, 46 (34,8%) an intermediate level, and 22 (16,7%) a graduation level or more.

Participants were divided in two groups on basis of the presence or absence of binge eating disorder symptoms, as assessed by the Eating Disorder Examination Interview. The Binge group was defined by the presence of at least one Binge Eating episode a week for the last 6 months. For the Binge group we have included both objective (OBE) and subjective binge eating (SBE) - where the amount of food eaten during the episode is not extremely big but is seen as excessive by the patient, and named it as the binge eating group (LOC). Based on this criteria, we have identified 21 (16,2%) of LOC participants opposing to 92 (70,8%) of non-LOC.

Measures

Eating Disorder Examination Questionnaire (EDE-Q, 5th version) (Fairburn & Beglin, 1994) is a self-report questionnaire directly based on EDE, and consists in 28 items with a seven point forced-choice rating scheme (0–6) where responders have to report to the last 28 days. EDE-Q generates 4 subscales (restriction, weight control, food concern and shape concern) and a total score. The diagnostic items of the EDE-Q were removed due to hospital requirements, because they were very similar to the diagnostic item found on ODE.

Obesity Disordered Eating Questionnaire (ODE) (Conceição & Machado, 2010) was designed as self-report measure to help detect the unique eating behaviors that appear mainly in obese patients, and helps trigger the eating problems that might persist

after surgery. For this reason, this self-report questionnaire includes a specific set of 4 questions for the postoperative period, being designed to be used either pre and post surgery.

This questionnaire is based in the EDE interview and in the DSM criteria for Binge Eating Disorder and some items were kept similar to the EDE. However, since we were interested in assessing a wider range of dysfunctional patterns, we have included items related to particular maladaptive behavior that tend to occur in obese population and some that appear only after surgery. The Obesity Disordered Eating questionnaire (ODE) includes a set of diagnostic items (parts A, B and C) and a total score (parts D and E) is divided in 5 different parts: A) Binge Eating – assesses the presence of grazing and bulimic or excessive eating episodes (objective and subjective). It covers the same time period and uses the same rating scheme as EDE, and it contains short definitions of the key items; B) Compensatory Behaviors (related to weight control); C) Post-surgery Eating Problems –addresses problematic consequences (such as vomiting; plugging, dumping related to surgery) that might result from surgery procedure; D) Eating Patterns – is designed to detect the presence of other dysfunctional eating patterns or attitudes (such as impulse to eat, guilty after eating, chew and spit, rumination, night eating, etc); E) Importance of Weight – to assess the influence of weight on self-esteem.

Part D and E together form the symptom composite of 21 items for the ODE total score, which includes cognitive items (such as guilt over eating, eating in response to emotions, being afraid of gaining weight), and behavioral items (such as inability to control eating, sweet eating, eating during the night). The rating scheme is a forced choice likert scale from "never" (0) to "more than once a day" (5), and addresses the frequency of the target behavior for the last 28 days. Higher values correspond to

highest dysfunction in eating behaviors. With exception, item 13 is an inverted item since higher frequency corresponds to least dysfunction. For this specific item, "never" should be rated as 4 and "every day" and "more than once a day" as 0. These items were generated based on observation in clinical practice of eating behavior that relate to overeating, and commonly appear in overweight population.

Procedure

Data were collected as part of a longitudinal study on eating related predictors of outcome in bariatric surgery. In one hospital center, patients were asked to participate in the study during their psychiatric pre-surgery screening. In the other treatment center, patients were referred to a preparation group for bariatric surgery by their surgeon. The initial evaluation was required to participate in the program. Most patients entered the program and completed a variable number of sessions (from 1 to 6), but some could only attend to this appointments with the psychologist. These sessions were seen as part of the evaluation for surgery but were not compulsory. Patients were also aware that the results from interview or questionnaires would not impact the medical decision to proceed with the surgical treatment.

Participants were interviewed by a psychologist trained in eating disorders evaluation and treatment, and fulfilled a set of 6 questionnaires including ODE and EDE-Q (version 5). The session consisted in a clinical interview to assess history of weight, psychological problems, eating patterns and motivation for surgery. For eating disorders diagnose, the diagnostic items of 12th edition of the EDE (Fairburn and Cooper, 1993) were used. The key behavioral features such as binge eating and inappropriate compensatory behavior (vomiting, excessive exercise and misuse of

laxatives or diuretics) were rated in terms of frequency for the last 3 months, and then expanded to the previous 6 months.

Statistical analysis

In order to test the reliability of the scale, Cronbach's alpha was used. To assess validity, parametric and non-parametric tests were conducted. For correlations between the different scales Pearson's r coefficient and Kendall's tau b were calculated, while t-test for independent samples was used to analyze the difference between groups on scales. Bonferroni adjustment was applied when multiple tests were conducted and partial correlations were carried out to control for current BMI, age, gender and time of surgery (pre or post surgery interview). Cohen's kappa (k) was used as a coefficient of agreement between the two measures for nominal variables (EDE and ODE diagnosis), particularly when detecting for presence of grazing, OBE (Objective binge episodes), SBE (subjective binge episodes), LOC (loss of control), vomiting and plugging. Additionally, we have analyzed Receiver Operating Characteristic (ROC) to better understand the agreement rate between the two diagnostic measures: Sensitivity (S) for the proportion of individuals with a positive interview diagnosis correctly identified by the ODE; Specificity (Spc) for proportion of individuals with a negative interview diagnosis correctly identified by the ODE; Positive predictive value (PPV) representing the proportion of individuals who were classified as having a positive diagnosis by the ODE who met criteria for the diagnosis with EDE. Negative predictive value (NPV) represents the proportion of individuals who were classified as having a negative diagnosis by the ODE and did not meet criteria for the diagnosis on the EDE. As a screening measure it is important that the self-report questionnaire does not exclude true positives (EDE-identified). For this reason we have analyzed False Negative Rate

(FNR) representing the proportion of cases identified as positive by the EDE, who were not recognized by the ODE. Finally, Accuracy (Acc) represents the proportion of individuals for whom the negative and positive ODE diagnoses matched the actual interview diagnoses.

Results

Item elimination

Our initial interest was to put together a set of items that would allow screening for maladaptive eating problems and detect disturbed attitudes related to eating and body weight, common in overweight population undergoing bariatric surgery. A total of 25 items were initially tested. Some of these behaviors (ruminate, chew and spit, and alcoholic drinking) were not very frequent and will be reported rarely and presented very low item-total correlation: chew and spit=-0,045; alcohol drinking=0,077; ruminating showed zero variance and was automatically removed from the scale. Despite being rare, research have considered these behaviors as important in this particular population as they are more common in people in weight loss programs and might suggest the presence of disturbed eating (Martina de Zwaan et al., 2004; Saunders, 2004). Also, deletion of these items improved Alpha coefficient for the total scale from 0,847 to 0,854. For this reason, these items will be removed from the total scale but will still be present in the questionnaire as they are related to this population. One other item that assessed the importance of weight and shape was deleted because it showed low correlation (< 0,2) with other items and total score, improving Cronbach's Alpha when deleted. This item also didn't prove to distinguish between the two ED

groups, for which the scale is designed, showing non-significant values in t-test analisis between the two groups. A final set of 21 items are included in the ODE total score.

Frequencies analysis of each single item showed that the total range of the respondent system was used, proving that it fits adequately the frequency of occurrence of the different behaviors.

Reliability – internal consistency

Reliability was assessed by calculating Cronbach's Alpha coefficient (0,855) and Cronbach's Alpha Based on Standardized Items (0,858).

Alpha coefficients and means' range are presented in Tables 1 and 2 respectively. Separately are presented the descriptive values and correlation coefficient for the cognitive items taken together and for the set of behavioral items included in the total scale. Statistics for two distinct groups are presented: Bingers (BED) participants referring loss of control (objective and/or subjective) over eating at least once a week; and non-Binge group (nBED).

Item-total correlation ranged between 0,143 and 0,631, with 4 of the items presenting low correlation (<0,30). These low correlated items assessed symptoms of night eating syndrome which might explain the results. Since night eating syndrome (NES) is a rare condition, the low correlation values and the fact that exploratory factor analysis didn't identify a night eating subscale might be due to the small number of patients in the evaluated sample experiencing NES (Allison et al., 2006).

Table 1 – Cronbach's Alpha for ODE.

	Cronbach's Alpha	**N**	**N of items**
ODE *total score*	0,855	92	21
ODE *cognitive items*	0,766	98	7
ODE *behavioral items*	0,793	95	14

Table 2 - Means, minimum and maximum values, and Standard Deviations for ODE.

	ODE *total score*			**ODE *cognitive items***			**ODE *behavioral items***		
	Total (N=92)	*BED (N=14)*	*nBED (N=63)*	*Total (N=92)*	*BED (N=14)*	*nBED (N=63)*	*Total (N=92)*	*BED (N=14)*	*nBED (N=63)*
M	28,91	36,85	23,69	11,93	15,31	9,94	17,36	21,20	14,37
Min	5	12	5	0	5	0	3	4	3
Max	68	54	51	28	25	27	49	32	38
SD	13,80	11,54	9,97	6,16	5,81	4,99	9,61	8,01	7,65

Construct Validity

To test how well the self-report measure performs in this particular population we have examined Convergent Validity by testing if the ODE total score was positively correlated with EDE-Q total score, a validated measure for eating disordered behavior. For this purpose we used the Pearson´s *r* correlation since both scales were normally distributed. Results for correlation and coefficient of determination are presented in Table 3. A positive correlation was observed between scores on the EDE-Q total score

and the ODE total score, accounting for 36,487 % of shared variance. A stronger and positive coefficient was found when correlating the cognitive subset of items separately with the EDE total score, which represents a important percentage of shared variance of 57,91%. However, low coefficients were found when correlating the behavioral set of items with EDE total score. All correlations were however significant at the 0,01 level and partial correlations controlling for BMI, age, gender and follow-up time (pre or post surgery) did not alter de results.

Table 3 – Correlation coefficients between ODE and EDE total score

ODE	**Correlation Statistics with EDE**		**Coefficient of determination (% of shared variance)**
	r [a]	tau *b* [b]	
Total score	0,604**	0,431**	36,48
Cognitive Items	0,761**	0,588**	57,91
Behavioral items	0,432*	0,308*	18,66

** Correlation is significant at the 0,000 level
* Correlation is significant at the 0,01 level
[a] Pearson's *r* for EDE total score and ODE total score and subset of items
[b] Kendall tau *b* for EDE total score and ODE total score and subset of items

To better support the convergent validity of this questionnaire we have examined whether the binge patients (BED) identified by ODE (diagnostic items based) showed the expected increase on EDE total score and ODE total score. The BED group ODE-identified presented significantly higher results on EDE scale ($t(105)= -5.49$; $p<0,001$) and on ODE scale *(t(86)=-5.86* ;$p<0,001$), when comparing to the non-BED group.

We have also tested the differences between the Binge vs non-Binge group diagnosed with EDE on the ODE total scores to examine divergent validity and test the ODE ability to distinguish the groups. Significant differences were also found (t(75)=-4,5; p<0,001).

The criterion validity was analyzed in order to check the degree of agreement in case detection between the results obtained by ODE and the EDE interview as a direct and gold standard measure for ED diagnose. To accomplish this, we tested whether, for each group (Bingers and non-bingers), ODE scale accurately identified between interview-identified participants with and without an ED. Table 4 presents the Kappa coefficient (*K*), sensitivity (S), specificity (Spc), Positive Predictive Value (PPV), Negative Predictive Value (NPV), False Negative Rate (FNR), and overall accuracy (Acc) for identification of the occurrence of the following episodes in the last month: Grazing; Objective Bulimic Episodes - OBE, Subjective Bulimic Episodes - SBE, Bulimic Episodes – BE– being OBE and SBE, Vomiting non related with weight control, and Plugging.

Table 4: Agreement between EDE and ODE diagnose.

	tau *b*	***k***	**S**	**Spc**	**PPV**	**NPV**	**FNR**	**Acc**
Grazing	0,33*	0,22*	0,96	0,38	0,35	0,96	0,04	0,53
OBE	0,19	0,1	0,8	0,63	0,10	0,98	0,2	0,64
SBE	0,51**	0,41*	1	0,75	0,34	1	0	0,78
BE	0,41**	0,31**	0,93	0,64	0,31	0,98	0,07	0,68
Vomiting	0,651*	0,596*	0,66	1	1	0,64	0	0,79
Plugging	0,418**	0,38	0,5	0,88	0,83	0,62	0,5	0,68

* p<0,001 ;**p<0,05

Discussion

The Obesity Disordered Eating Questionnaire is a self-report measure of dysfunctional eating and psychopathological comorbidities related to eating disorders that suits the obese population in general and the patients undergoing bariatric surgery. Items were selected from clinical interviewing are relate to maladaptive eating behavior that commonly occur in this population. ODE includes a set of diagnostic items and a total score.

Evidence of reliability

The scale total score proved to have good internal consistency for this sample. The item-total and the item-item correlation ranged from low to reasonable values for some of the items included in the scale. This might be because we included in the scale maladaptive behaviors that usually do not occur simultaneously, nor they have the same psychological correlates. For instance, some patients checking high on grazing items might or might not report "going a long time without eating". Keeping in mind that none of the behavior items of the scale are compensatory behaviors to control weight, these two items might correspond of different maladaptive eating behavior that are usually found in the obese population, but do not necessary occur simultaneously. However, given the Cronbach's Alpha value, the total item composite seems to be working together and to be measuring the same underlying construct. Since the scale included either cognitive items (related to dysfunctional eating attitude and to eating disorders), and behavioral items (related to different types of eating behaviors, regardless of the cognitive disturbance), we have tested these two set of items

separately. As expected, Cronbach's Alpha coefficient was lower than the value found for the total scale, but still suggests a reasonable internal consistency.

Evidence for Validity

These results provide support for adequate validity of the ODE as a self report measure for eating disorder symptomatology and as a screening measure for maladaptive eating behaviors. ODE presented good correlations with standard measure and proved to be able to screen for binge eating episodes.

Correspondence with gold standard measures

Results suggest that ODE related positively with EDE-Q, a well established and gold standard self-report measure for eating disorders psychopathology. The two measures presented an important percentage of shared variance, reveling high correlation levels with statistical significance, proving that there is a strong correspondence between the EDE-Q and ODE scores. Since EDE-Q mainly related to cognitive aspects and attitudes of eating disordered patients, it was not surprising to have the cognitive items correlate with EDE total score more strongly when taken separately and sharing a good percentage of variance. We keep in mind that the behavioral items include a range of behaviors that do not necessarily reflect eating disorders but disordered eating, but might be related to increased caloric intake that seems to occur in the obese population. This might be the reason why the correlation coefficient of the behavioral subset of items with EDE-Q is lower, despite statistically significant.

Further support for validity of the ODE was found in that the two groups identified by ODE presented statistical differences on EDE results, being the group with loss of control that showed expected elevated scores on this extensively validated measure (EDE-Q).

ODE also proved to be an adequate measure to differentiate the eating disorder groups as the Binge group interview-diagnosed presented significantly higher values on the ODE total score.

Identification of eating problems.

Despite, rather low correlation coefficients in identification of eating problems, the results in our study are similar to those that compare EDE-Q with EDE in the eating disorders population and in the obese population undergoing bariatric surgery (Fairburn & Beglin, 1994; Kalarchian et al., 2000). Surprisingly, and on the contrary of other studies (Martina de Zwaan et al., 2004), objective binge eating episodes was the behavior presenting worse agreement between measures and subjective binge eating the behavior with best predictive values. This might be related to the definition of amount of food that, in the morbid obese populations might be based in different standards than for general population. Also, when undergoing bariatric surgery, the referential for amount of food changes dramatically, together with feeling of overeating (feeling uncomfortably full, felling nausea, feeling sick because of the amount of food eaten). This might be a confusing variable when checking for these behaviors.

Nonetheless, despite poor values of Accuracy, as a screening measure it is important that the ODE does not exclude True Positive (TP) cases. Results show that the proportion of positive cases detected by the interview that were not identified with

the questionnaire is very low for the four different types of behaviors. Results also show that ODE performs reasonably well in detecting a good proportion of TP (good levels of Sensitivity). ODE presents however, lower values of Specificity, suggesting that it tends to overestimate, as other well established self-repot measures tent to do (Fairburn & Beglin, 1994).

It is also noteworthy that, although ODE does not perform fairly in detecting objective binge episodes, when we merge OBE and SBE, correlation coefficients and chance corrected agreement increase, presenting significant correlations with the interview and higher predictive coefficients. This supports our thoughts on the relevance of the definition of "big amount of food" since that when we assess only "loss of control over eating", ODE performs better identifying cases. This also provides support for intensive discussion on the importance of the amount of food eaten in the definition of a binge eating episode. Considering "loss of control", ODE performs very similarly to other self-report measures that were studied in this particular population (Celio, Wilfley, Crow, Mitchell, & Walsh, 2004; Grilo et al., 2001; Kalarchian et al., 2000).

A limitation of the study and another reason for the difficult in correctly identify bulimic episodes might be related to the academic level that often makes it difficult to understand complex concepts such as "loss of control over eating", and to use adequately the rating system. In fact, when addressing more objective episodes such as vomiting, participants tend to better identify them, and the questionnaire presented better correlation levels with the interview. Most of our participants had low education levels and even the experienced interviewers that evaluated these patients reported difficulties in making themselves understand when asking the diagnostic questions. In fact, the behaviors that appear to be most confusing during the interview would be to

decide on “loss of control” and “amount of food”. Interviewers often reported that the felling of “loss of control” was not as distinct as they find in eating disorder patients, usually because of a lack of strong desire to strictly control weight and eating, and that these patients vary from giving up from this willing of control eating and weight, to be very uncomfortable with loss of control. This ambivalence, together with a well known effect of social desirability (Keel, Crow, Davis, & Mitchell, 2002) might influence responders in self-report measures.

As mentioned before, the EDE diagnostic items were removed because they were very similar to the diagnostic items of ODE, and it would be too time-consuming and eventually tiresome for respondents. The other important reason that supported the removal of these items is that respondents might be biased when facing so similar questions in the same assessment, and this could increase the correlation levels found for binge eating episodes between these two measures. We would expect however, that participants would respond similarly to the EDE-Q diagnostic items. To overcome limitations to this study, it would have been ideal to have the ODE compared with the EDE-Q on its diagnostics items. We were limited to the comparison between a clinical interview and a self-report measure, but we would like to be able to compare the ODE with another self-report measure to test its agreement in identifying target eating disordered behaviors. Also, our BED group and the postoperative group of patients were rather low. Further research would be important to support the validity of the ODE on BED obese patients and in post-surgery at short and long term follow-ups.

Conclusion

The novelty of this measure is that it allows researchers and clinicians to address the specific problematic eating behaviors and eating patterns in obese patients, particularly in those undergoing bariatric surgery, that usually are neglected in measures developed for eating disordered patients. In fact, ODE was designed to screen for a wider range of maladaptive eating behavior that traditionally do not appear in BN or BED, and therefore, have been extensively neglected in research and clinical work.

This study provided evidence for reasonable psychometric properties of the ODE as a self-report measure for dysfunctional eating behavior in the obese population undergoing bariatric surgery. ODE proved to be a good screening measure for maladaptive eating behavior and bulimic episodes, and to be able to detect psychopathologic characteristics and attitudinal aspects of eating disorders. The scale shows good internal consistency, suggesting that it is reliable with this population and proved to be a good continuous measure for dysfunctional eating and for detecting eating disorder core features (attitudes about weight) as it related to EDE total score. It also revealed good correlation with other eating disorders measures (EDE-Q) that are considered gold standards for eating disorders patients.

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CHAPTER IV

Treatment Outcomes in Bariatric Surgery: the Role of Eating Behaviors and Eating Symptomatology

Conceição, E. and Machado, P.P.

Abstract

BACKGROUND/OBJECTIVES: Bariatric surgery is associated with a significant improvement in physical and mental health of the morbid obese patients. However, the presence of maladaptive eating behaviors and related clinical symptoms compromise the outcomes of this surgery. The present study aims to investigate the point prevalence of disordered eating behaviors before and after surgery, at short and long-term follow-up, and to explore the impact of postoperative eating behaviors on weight loss (WL) and weight regain (WR).

METHODS: This cross-sectional study-design compared a group of preoperative patients (n= 176) and two postoperative groups, short-term (n=42) and long-term (n=28), undergoing bariatric surgery. Assessment included a clinical and diagnostic interview and a set of self-report measures to assess eating disorders symptomatology, general distress, depression, impulsivity, body image issues, and dysfunctional eating problems.

RESULTS: Forty- seven (26,7%) of the patients evaluated at pre-surgery, six (14%) assessed at short-term, and seven (30,4%) at long-term reported loss of control. The point prevalence of grazing behavior was significantly different (Chi^2=11,395, $p<0,05$), with 34,5% (59), 11,6% (5) and 47,8% (11) of patients reporting grazing at pre, short-term and long-term after surgery respectively. Loss of control related with poorer outcomes, particularly at long-time follow-up, with higher BMI, less weight loss, more weight regain, and more eating disorders related psychological symptoms, particularly

when associated with grazing behavior. A final regression model including several eating related features, explained 68,5% of the variance in weight regain (R^2aj =0,64, p <0 ,001) (F (6,45)=16,32, p <0,001) and 31,5% of the variance of %WL (R^2aj =0,22, p < 0,01) (F (6,45)=3,44, p <0,01).

DISCUSSION: Despite the improvement in eating behavior and related symptomatology with bariatric surgery, the presence binge eating, grazing behavior and eating related psychological features was related to weight regain and poorer outcomes.

KEY-WORDS: Obesity surgery, eating disordered behaviors, outcomes research, outcome predictors

Introduction

Researchers and clinicians agree that bariatric surgery is currently the most viable option for successful weight loss and maintenance in the morbidly obese individuals (NIH, 2000). However, there is a reasonable variance of weight outcomes with some patients not achieving successful weight loss, or presenting a high percentage of weight regain (L. K. George Hsu et al., 1998).

Despite not being considered an eating disorder, obesity is often associated with eating disordered symptoms and maladaptive eating patterns (Fischer et al., 2007; Niego, Kofman, Weiss, & Geliebter, 2007). Failure to surgery is commonly associated with incapacity to follow the diet prescriptions in relation to patients' eating behaviors such as quantity and quality of food consumed, daily eating schedule and manner in which meals are consumed. In fact, patients' difficulty in adjusting to the modification in eating behavior has been reported as a major problem (Poole et al., 2005; Saunders, 2004; van Hout, Verschure, & van Heck, 2005). Apart from the distinctive eating disorders, such as binge eating, night eating syndrome or bulimia nervosa, other dysfunctional and maladaptive eating behaviors have been studied. Problematic eating behaviors like grazing behavior and compulsive eating (Colles, Dixon, & O'Brien, 2008; Saunders, 2004); consuming large quantities of soft or liquid foods which pass quickly through the bypassed stomach (Bocchieri, Meana, & Fisher, 2002); eating large quantities of sweet foods and liquid or soft foods (L. K. George Hsu, Betancourt, & Sullivan, 1996) has been reported among patients who regained weight after surgery.

These data have made researchers interested in exploring the impact of eating disordered behaviors on weight outcomes and in studying eating related factors predictors of outcomes.

Previous research work is consistent in considering obese binge eaters as a distinctive group (L. Hsu et al., 2002; Kalarchian, Wilson, Brolin, & Bradley, 1998). However, despite binge eating has been related to poorer outcomes, some controversy remains regarding the relationship between binge status and treatment success (van Hout et al., 2005).

Some studies reported that eating behavior and associated characteristics change with surgery, binge status disappears and a normalization of eating patterns is observed, even in long-term assessments (Larsen et al., 2004). For instances, Mitchell et al. (2001), presented data from a long-term follow-up assessment (13 to 15 years) of a cohort of 78 patients undergoing gastric bypass for morbid obesity. Main findings show that the majority of individuals who met criteria for binge eating disorder did not meet such criteria at long-term follow-up (n=29), even if the criterion for eating a large amount of food was excluded, and only a small number of patients (n=9) persisted with BED status in the follow-up assessment.

Other studies argue that maladaptive eating behaviors reappear after the initial apparent normalization, compromising weight outcomes (L. K. G. Hsu, Sullivan, & Benotti, 1997; White, Kalarchian, Masheb, Marcus, & Grilo, 2010).

To better support the patient and promote successful weight loss, a better understanding of the relationship between disordered eating behaviors and treatment outcomes is crucial. This study intends to examine the variation in presence of disordered eating behaviors at short and long-term follow-up after bariatric surgery, and to explore the impact of postoperative eating behaviors and associated psychological characteristics on weight loss and weight regain.

Material and Methods

Subjects and procedure

This cross-sectional study-design compared a group of preoperative patients (n= 176) and two postoperative groups, short-term (n=42) and long-term (n=28), undergoing bariatric surgery for obesity treatment in two central hospitals in the North of Portugal, and a private practice. Patients evaluated preoperatively where within 3 months of surgery and had been in the waiting list for over a year. Fifty four (76,1%) patients underwent gastric banding surgery , 13 (18,3%) had gastric sleeve surgery, and 4 (5,6%) gastric bypass. Table 1 presents demographic information and relevant clinical data.

Patients were contacted over phone and asked to participate on the study. For preoperative patients evaluated with more than a month before surgery, we would offer preparation sessions for bariatric surgery. Some patients were evaluated in the day before surgery and already were as inpatients in the hospital center. The postoperative patients were informed of the study objectives and were offered a single follow-up session. Most of the patients agreed in participating in the study and gave written informed consent.

In this study, T0 will be considered the preoperative group, T1 the short-term group of patients evaluated within the first 24 month of follow-up, and T2 the long-term group of patients evaluated with more than 24 month after surgery.

Table 1 – Demographic information and clinical characteristic of the patients.

	Pre (T0) n=176	**Short-term (T1) n=43**	**Long-term (T2) n=28**
Women(men)	88,6%(11,4%)	88,4%(11,6%)	85,7%(14,3%)
Age(years) *M(SD)*	41,65(10,79)	40,11(10,67)	43,52(10,94)
Follow-up time (months) *M(SD)*	-	8,1(4,2)	84,15(31,99)
Preoperative BMI	44,19(5,56)	43,92(4,29)	46,34(7,74)

For the purpose of this study, we have considered loss of control (LOC) as the main target variable, which comprehends both objective and subjective binge eating episodes, because these two groups have shown to be very similar in clinical characteristics by several previous research works (White et al., 2010). All target behaviors (presence of loss of control over eating (LOC); objective binge eating episodes; grazing behavior; vomiting and plugging) were considered present when patients reported the behavior at least once a week in the previous month. In our sample, only one patient reported experiencing dumping syndrome and was considered in the plugging group. Induced and spontaneous vomiting non-related to weight control compensatory behaviors were merged in the same dichotomous variable.

Instruments

A clinical interview assessed socio-demographics and clinical features, such as BMI, current and past treatment and current and past medication, eating habits, and diet and weight history.

To establish an eating disorder diagnose and assess eating behaviors and eating problems (such as grazing, plugging, dumping, vomiting), was used an adapted version of the Eating Disorder Examination (C.G. Fairburn & Cooper, 1993), modified by de

Zwaan M, Swan-Kremeier L and Mitchell J. "Grazing" behavior was considered when patients reported consuming repeatedly modest quantities of food between standard snack and meal times, in an unplanned way.

A set of self-report measures to assess eating disorders core features, maladaptive eating patterns, body shape issues, symptomatic distress levels, depressive symptoms and impulsivity levels. Eating disorder Examination questionnaire (EDE-Q, (Christopher G. Fairburn & Beglin, 1994). A self-report questionnaire to assess eating disorder symptoms and associated psychological characteristics. This 28 items questionnaire generates 4 subscale scores (restraint, eating concern, shape concern, and weight concern), as well as a global score. Patients answer in a 7-point scale (i.e. 0–6) indicating the number of days out of the previous 28 in which particular behaviors, attitudes, or feelings occurred. Obesity Disordered Eating Questionnaire (ODE) (Conceição & Machado, 2010) This self-report measure EDE based, that assesses wider range of dysfunctional eating episodes that tend to occur in obese population undergoing obesity surgery. Answers relate to the previous 28 days in a likert scale rating scheme. It is divided in 5 different parts: A) Binge Eating – assess the presence of grazing and bulimic or excessive eating episodes (Objective and subjective); B) Compensatory Behaviors; C) Post-surgery Eating Problems – such as vomiting; plugging, dumping related to surgery; D) Eating Patterns – for dysfunctional eating patterns or attitudes (such as impulse to eat, guilty after eating, chew and spit, rumination, night eating, etc); E) Importance of weight on the self-esteem. Part D and E form the symptom composite of 21 items of the ODE total score. Barratt Impulsivity Scale – BIS-11(Patton, Stanford, & Barratt, 1995). A 30 items self-report questionnaire developed to assess impulsivity, designed as a 4-points rating scale (Never to Always). The scale allows three subscores: motor (acting without thinking), cognitive (quick

decisions), and non-planning (present orientation) impulsivity. Body Shape Questionnaire – BSQ(Cooper, Taylor, Cooper, & Fairbun, 1987). A 34 item self-report questionnaire to evaluate concerns about body and shape in eating disorders patients. Respondents rate their answers in a 0 to 6 scale regarding feeling about their appearance over the past four weeks. It generates a total score with higher scores corresponding to clinically relevant concerns about weight and shape. Outcome Questionnaire - 45 – OQ45.2 (Lambert et al., 1996). This is a 45 item self-report questionnaire that assesses general psychological distress and social impairment. Items are gathered in 3 subscales (interpersonal relationships, social roles, and symptom distress) and a total score scale, and patients respond in a 5-point rating scale (never to always). Beck Depression Inventory, BDI (Beck, Steer, & Garbin, 1988), the widely known self-report questionnaire, commonly used in research as a measure of depression symptomatology. For the purpose of this study, and based on recommendations to adapt the questionnaire to the obese patients undergoing surgery, the item 18 and 19 were removed (Hayden, Dixon, Dixon, & O'Brien, 2010).

Statistical analyses

Percentage of weight loss (%WL) was calculated using the reported preoperative weight (PRE), measured by a clinician in the surgery day, and the weight measured at the postoperative session (POST), being the result of the equation [(PRE-POST)/PRE] *100

Weight regain (WR) was calculated as the difference between, and the weight measured at the postoperative session (POST) and the lowest weight (LOW) achieved after surgery (POST– LOW). For the 2x2 Pearson Chi² analyses, WR was considered positive when higher than 3kg.

As no significant differences were found between patients with and without loss of control in age, gender and preoperative weight, these variables were not considered as covariates.

Chi-square analysis was used to compare the proportion of individuals with target behaviors in each assessment time point (T0, T1, T2), and to compare dichotomous variables (presence of grazing, vomiting, dumping, weight regain) with presence of loss of control variable in 2x2 tables. Mixed measures between-within subjects analyses of variance was conducted to compare patients with and without LOC in preoperative BMI, lowest BMI and postoperative BMI. To test the variance in the questionnaire scores in the three different assessment times (T0, T1 and T2), two-way between-groups analyses of variance were conducted. Two way between-groups analyses of variance were used to test the influence of LOC *vs* non-LOC patients, and another dichotomous variable (T1 *vs* T2 time; grazers *vs* non-grazers), on different continuous dependent variable (%WL; WR; postoperative BMI and questionnaires scores). To further explore some differences observed in ANOVA analyses, t-test was conducted in single time points when appropriate. Bonferroni adjustment to the alpha level was applied to multiple comparisons. To explore postoperative predictors of weight regain and weight loss was used multiple linear regression analysis. Non-parametric tests were used when assumption for parametric analyses were violated. Apart from the reported cases, the parametric test is presented when the non-parametric test confirmed significance value. Further details of these procedures are presented in results section. Significance was considered for $p<0,05$. All analyses were conducted with PASW – 18 for Windows. Differences in the sample sizes across analyses are due to incidental missing values on measures.

Results

Eating behaviors and eating related symptoms before and after surgery

Based on EDE interview, 26,7% (47) of the patients evaluated at pre-surgery, 14% (6) assessed at short-term, and 30,4% (7) at long-term reported loss of control (LOC) over eating at least once a week in the previous month. Despite the apparent decrease in bulimic episodes at short-term, the proportion of individuals with loss of control in each time point (pre, short-term and long-term) was not statistically significant (Chi^2=3,45 *n.s.*),

However, when testing the presence of Objective Binge Eating (OBE) episodes, significant differences were found between the patients in the pre, short and long-term group (Chi^2=7,83, p<=0,05), with 15,9% (28), 0%(0) and 13% (3) reporting the presence of OBE episodes at least once a week in the previous month. These differences were between the proportion of patients at pre-surgery and short-term follow-up (F.U.) reporting OBE episodes (Chi^2=7,84, p=0,005; Fisher´s exact test, p<0,05), and the short and long-term (Chi^2=5,88, p<0,05; Fisher´s exact test, p<0,05), but not between the pre and long-term group (Chi^2=0,13, n.s).

Regarding grazing behavior, the proportion of participants reporting grazing between meals was significantly different (Chi^2=11,4, p<0,05) for each group of patients (pre, short and long-term assessment), with 34,5% (59), 11,6% (5) and 47,8% (11) of patients reporting grazing behavior respectively. Pearson's Chi^2 test showed that the percentage of patients reporting grazing behavior differed between pre-surgery and short-term (Chi^2=8,58, p<0,005; Fisher's Exact Test, p<0,05), and between short-term and long-term (Chi^2=10,69, p=0,001; Fisher's exact test, p<0,05), but not between the pre-surgery and long-term assessments (Chi^2=1,56, *n.s*).

Other associated eating symptoms (Table 2) seem to be lower after surgery. One way ANOVA was used to test the impact of F.U. time on several psychological eating disorder related features and associated comorbidities. Significantly lower scores on eating symptomatology – EDE-Q – ($F=13,79$, $p=0,000$), body shape (BSQ) ($F=6,53$, $p<0,05$), impulsivity (BIS-11) ($F=21,65$,$p=0,000$), and depression (BDI) ($F= 9,48$, $p=0,000$), were reported both at short-and long-term F.U. than the pre-surgery assessment. Regarding general distress symptomatology (OQ45), Scheff post-hoc test revealed that the pre-surgery group differed significantly when compared to the short-term group ($F= 5,82$;$p<0,05$), but no differences were found between the pre and long-term group. For all measures, no significant differences were found between short-term and long-term postoperative groups.

Table 2 –Psychological eating characteristics and related symptomatology in preoperative and the tow postoperative cohorts of patients

	T0 – pre surgery			**T1 – short-term**			**T2 – long-term**		
	n	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**
EDE-Q	142	2,78	1,06	35	1,98	1,24	26	1,76	1,22
OQ.45	125	54,57	22,43	34	40,61	23,07	24	48,68	12,12
BSQ	73	103,15	36,37	35	80,21	35,28	25	80,80	36,12
BIS	136	67,40	8,45	33	59,35	7,56	24	58,61	6,26
BDI	138	11,21	8,80	32	4,97	7,92	23	6,26	4,74

The role of Loss of Control (LOC) in weight outcomes and eating symptomatology

Mixed measures between-within subjects analyses of variance was used to test the difference between patients with and without LOC in preoperative BMI (PRE),

lowest BMI since surgery (LOW) and post-operative BMI (POST). We found a significant main effect for time (Wilks' Lambda=0,33, F(2,62)=62,18 ,p<0,001) and a significant interaction effect between LOW and POST BMIs (Wilks' Lambda=0,76, F(2,62)=9,93 ,p<0,001), showing that the two groups present a different change in BMI over time (graf 1). All pairwise comparisons were significant (p<0,001), presenting a decrease in BMI from PRE to LOW, but an increase from LOW to POST. Postoperative BMI was still significantly lower that the preoperative BMI.

However, despite differences between LOC and non-LOC in patients' BMI, at PRE, LOW and POST, no statistical significance was achieved in the tests of between – subjects effects (F(1,63)=0,002, n.s.). LOC and non-LOC patients didn't differ in BMI, but LOC group presented a greater increase from BMI LOW to BMI POST surgery, with BMI mean value greater than 35, i.e., within the Severe Obesity (Class II obesity) range (Table 3).

Graf.1

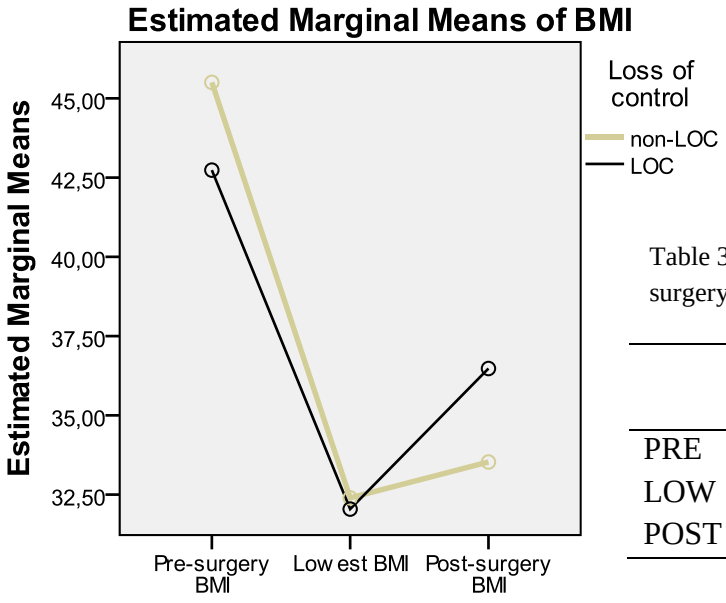


Table 3 - Means and standard deviations for BMI at pre surgery, lowest BMI and post surgery.

	LOC ***M(SD)***	**Non-LOC** ***M(SD)***
PRE	42,74(1,66)	45,50(,83)
LOW	32,04(1,44)	32,39(,72)
POST	36,48(1,48)	33,53(,74)

In an effort to better understand the differences between LOC and non-LOC group on BMI at post-surgery, and to evaluate the role of the follow-up time, a Two Way ANOVA was conducted for the dependent variable BMI post-surgery, with the fixed factors LOC *vs* non-LOC and T1 (patients evaluated with <24 months post surgery) *vs* T2 (patients evaluated with >24 months post surgery). No significant differences were found for the main effect of presence of LOC (F(1,61)=3,61, n.s.), and time (F(1,61)=0,04, n.s.) and there was no significant interaction effect (F(1,61)=0,65, n.s.). However, patients without LOC evaluated at T2 (with >24month F.U.) presented a lower BMI (M=32,36; S.D.=6,1) than those evaluated at T1 (with <24 month F.U.) (M=34,05; S.D.=4,82), while patients with LOC evaluated at T2 presented higher BMI (M=36,96; S.D.=7,15) than those evaluated at T1 (M=35,92; S.D.=4,74).

Percentage of weight loss (%WL)and Loss of Control (LOC)

Two ways ANOVA was conducted to explore the impact of the presence of LOC (LOC vs non-LOC) and the time of assessment (T1 vs T2) on percentage of weight loss. There was a statistically significant main effect for the independent variable LOC (F(1,62)=11,52,p=0,001), with the group non-LOC presenting higher %WL (losing more weight) in all different time points. No significant effect for the F.U. time (F(1,62)=0,17,n.s), nor for interaction (F(1,62)=0,59,n.s.) was found.

In an attempt to further explore the lack of significance in %WL with time, split file function was used to test separately the LOC and the non-LOC groups for differences in %WL between T1 and T2. T-test revealed a significantly higher %WL at T2 when compared with T1 for the non-LOC group (t(51)=-2,33,p<0,05) ,suggesting that patient without LOC have lost significantly more weight at long-term F.U. than at short-term F.U.. However, these differences in the LOC group didn't reached statistical

significance (t(11)=-0,31, n.s.), which might explain the lack of significant main effect for time previously (Table 4).

Weight Regain (WR) and Loss of Control (LOC)

Two-way between groups analysis of variance was used to test differences in weight regain (WR) as dependent variable, between the LOC *vs* non-LOC patients and T1 *vs* T2 groups as the two fixed factors. Significant main effect for LOC was found ($F(1,62)=15,01, p<0,001$), with LOC patients showing significant WR in both time points (T1 and T2). The main effect for Time (T1 and T2) was also significant ($F(1,62)=27,59, p<0,001$), but no interaction effect was observed ($F(1,62)=0,15$, n.s.), suggesting that both groups (LOC vs non-LOC) present a higher WR at long-term (T2) than at short-term (T1) (Table 4).

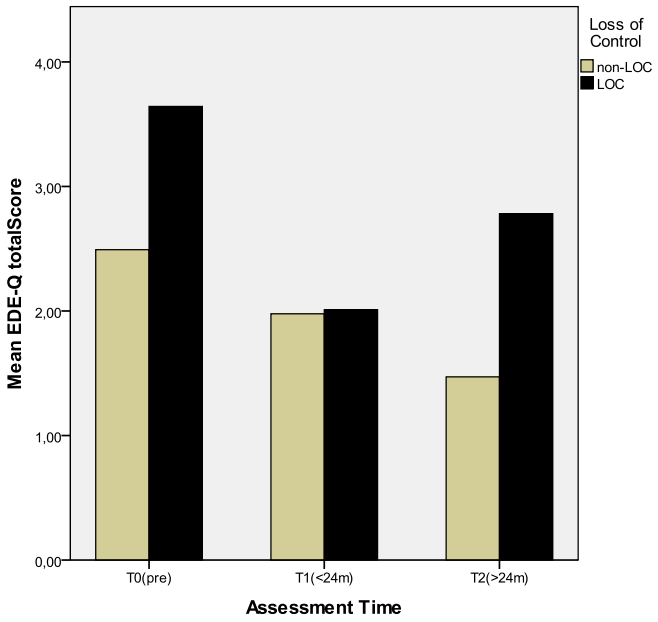
Independently examining each of the follow-up times (T1 and T2), Pearson Chi^2 test showed significant differences in the proportion of LOC patients that regain weight, when compared to the non-LOC group at T1, with 2 (33,3%) patients out of 6 with LOC presenting weight regain, while only 1 (2,7%) patients out of 37 without LOC regained weight ($Chi^2(1)=7,46, p<0,01$; Fisher's Exact test<0,05). However, at T2 no significant differences were found with both LOC and non-LOC presenting a high proportion of patients with WR. All 7 participants with LOC had regained weight, and 13 (81,3%) out of 16 patients without LOC presented WR ($Chi^2(1)=1,51$, n.s.; Fisher's Exact test, n.s.).

Table 4 – means and Standard deviation for percentage of weight loss (%WL) and weight regain (WR).

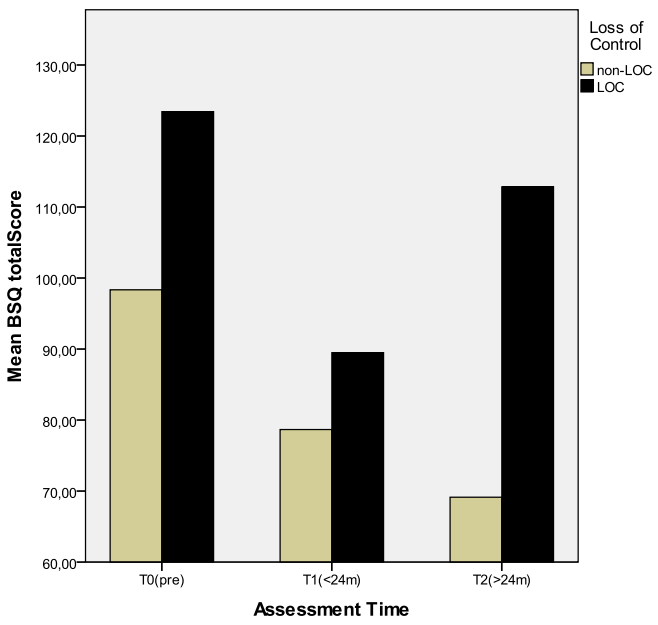
	LOC *M(S.D)*		**Non-LOC** *M(S.D)*	
	T1	**T2**	**T1**	**T2**
%WL	13,1(11,39)	15,39(15,07)	23,07(9.98)	31,22(15,01)
WR	6,5(11,13)	16,57(10,39)	0,27(0,95)	8,96(6,74)

Associated Symptomatology and Loss of Control

Graf.2



Graf.3

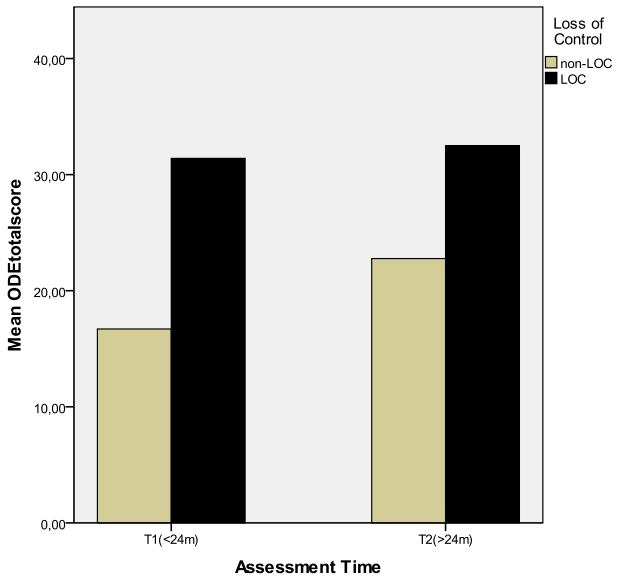


Significant differences in eating features were found between patients with LOC vs non-LOC in the scores of the eating disorder related symptoms' questionnaires.

Two-way ANOVA revealed a significant main effect for LOC ($F(1,193)=11,83$, $p=0,001$) and time ($F(2,193)=12,66$, $p<0,001$), but no significance for interaction effect ($F(2,193)=$, n.s.). However, patients with LOC scored significantly higher for eating symptoms – EDE-Q – at T0 ($t(140)=-6,26$, $p<0,0001$) and T2 ($t(20)=-2,42$, $p=0,025$), but not at T1($t(33)=-0,05$, n.s.) (Graf.2).

When applied the Bonferroni adjustment for multiple comparison, differences at T2 became marginally significant, but non-LOC group present their lowest score at long-term while the LOC group shows the highest values in symptoms.

Graf.4



The same significant changes in BSQ scores where revealed by two-way ANOVA , with a significant main effect for LOC ($F(1,123)=9,36$, $p=0,003$) and time ($F(2,123)=4,528$, $p=0,013$),and no interaction effect ($F(2,123)=0,95$, n.s.). After Bonferroni adjustment for multiple comparisons, LOC patients also reported higher body shape issues – BSQ – at T0 ($t(71)=-2,39$, $p=0,013$) and at T2($t(19)=-2,78$, $p=0,012$), but not at T1($t(33)=-0,63$, n.s.) (Graf.3).

Regarding ODE, a measure for evaluation of dysfunctional eating behaviors, patients were assessed only at T1 and T2. Again, results showed a significant main effect for LOC ($F(1,48)=17,26$, $p<0,001$), with LOC patients reporting significantly higher scores. No Time main effect ($F(1,48)=1,49$, n.s.) or interaction effect was observed ($F(1,48)=0,71$, n.s.). However, the non-LOC patients presented significantly higher scores at T2 than at T1 ($t(39)=-2,36$, $p=0,023$), while no significance ($t(9)=-0,16$, n.s.) was reveal in LOC patients between both time points (Graf.4).

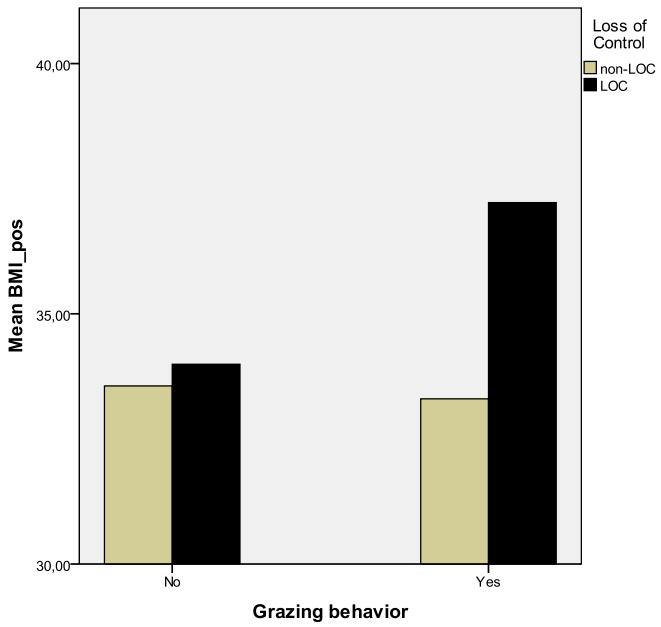
Vomiting, plugging and Loss of control

Vomiting and plugging are common problems in the first months after surgery that appear in reaction to eating choices or behaviors, and should disappear with time, as eating behavior normalizes after initial drastic restriction.

We have tested whether these behaviors occur more within patients with LOC. Chi² test revealed that the proportion of LOC patients reporting vomiting (self-induced and spontaneous) and plugging was significantly higher for LOC patients. In fact, all 7 patients with LOC reported occurrence of vomiting in the previous month, against 21 (55,3%) out of 38 of the non-LOC ($Chi^2=5,03$, $p<0,05$; Fisher´s exact test, $p<0,05$). Moreover, significantly more LOC patients (10 – 76,9% – out 13) reported plugging in the previous month, against only 21 (39,6%) out of 53 of the non-LOC patients ($Chi^2=5,83$, $p<0,05$; Fisher´s exact test, $p<0,05$).

Dysfunctional eating and outcomes

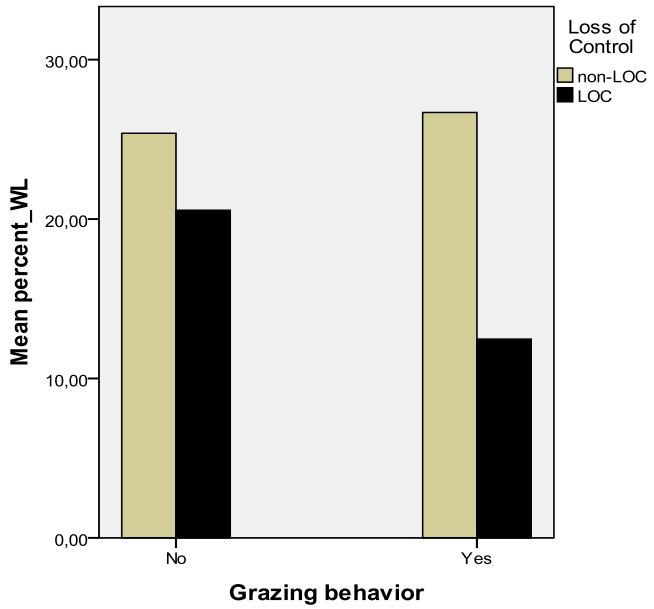
Graf.5



Grazing behavior was tested in order to understand its influence on weight outcomes. No significant differences were found between patients reporting grazing and non-grazer patients in BMI at post-surgery ($t(63)=-1,393$, n.s.). A

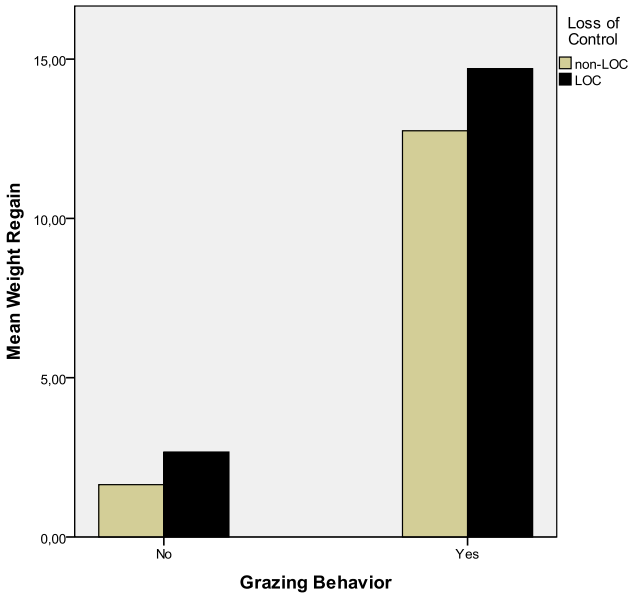
two-way ANOVA for BMI post-surgery was conducted, with LOC and Grazing as fixed factors. No significant main effects (F(1,61)=1,05, n.s. and F(1,61)=0,49, n.s., respectively) or interaction effects (F(1,61)=0,67, n.s.) were found, but the presence of grazing seems to have an impact on BMI when associated with LOC (Graf. 5). T-test for differences between LOC and non-LOC in patients reporting grazing behavior, revealed no significant differences for LOC (t(14)=-1,23, n.s.).

Graf.6



To test the impact of grazing behavior and LOC on percentage of weight loss (%WL), two-way analysis of variance was used. No significant main effects were found for LOC (F(1,62)=3,78, n.s.) or grazing (F(1,62)=0,48, n.s.), nor for interaction effect (F(1,62)=0,92, n.s.). However, differences in %WL between grazers and non-grazers were marginally significant (t(64)=1,99, p=0,051). Exploring differences between LOC and non-LOC in patients reporting grazing behavior, non-parametric Mann-Whitney U test showed

Graf.7



marginally significant differences (z=-1,95, p=0,051) with the LOC groups presenting lower %WL. (Graf.6)

Differences in weight regain (WR) were tested with non-parametric Mann-Whitney U test, due to normality and homogeneity of variances' problems. Significant differences in weight regain between grazers and non-grazers were found (z=-5,003, p<0,0001), but not between LOC and non-LOC groups(graf.7).

Predictors of Outcome: maladaptive eating patterns and weight

In an effort to better explain the variance in weight outcomes, and given the lack of single variables capable of fully explain differences in weight loss or weight regain, linear multiple regression analyses were conducted. Post-surgery eating related features were put together to test the predictive value on weight outcomes, particularly on weight regain and percentage of weight loss. The model included the independent variables ODE, BSQ, EDE-Q, follow-up time in months, presence of loss of control, and presence of grazing behavior. As a whole, the model significantly explained 68,5% of the variance in WR (R^2aj =0,64, p <0 ,001) (F (6,45)=16,32, p <0,001). Individually, the presence of grazing behavior, the F.U. time and the ODE score (dysfunctional eating behaviors) made a statistically significant contribution (p<0,05) (see Table 4).

The same model also significantly explained 31,5% of the variance of %WL (R^2aj =0,22, p < 0,01) (F (6,45)=3,44, p <0,01). Independently, time made a statistically significant contribution, and marginally significances were found for EDE-Q and presence of grazing behavior (p=0,052 and p<0,054 respectively) (see Table 5).

Table 5 – Individual statistics for percent WL and WR predictors.

	R^2(R^2aj)		F(6,45)		β		*t (p=)*	
	%WL	**WR**	**%WL**	**WR**	**%WL**	**WR**	**%WL**	**WR**
EDE-Q					-0,43	0,05	-1,99 (0,052)	0,36 (0,724)
ODE					0,23	-0,34	1,28 (0,208)	-2,58 (0,013)
BSQ					0,08	0,14	0,36 (0,717)	0,98 (0,334)
LOC	0,32(0,22)	0,69(0,64)	3,44	16,32	-0,22	0,08	-1,35 (0,183)	0,77 (0,446)
Grazing					-0,33	0,53	-1,98 (0,054)	4,64 (0,000)
Time					0,33	0,56	2,38 (0,022)	5,89 (0,000)

Discussion

We intended to study the impact of surgery on eating behaviors and associated symptomatology, and the influence of eating behavior in weight outcomes.

Our results are close to the ones found by Larsen, et al. (2004). Generally, the point prevalence of bulimic episodes (presence of loss of control over eating), and dysfunctional eating behaviors (presence of grazing), seem to change with follow-up time. In fact, the lower frequency of these behaviors at short-term (less than 24 months after surgery) suggests an improvement in eating patterns within the first two years of F.U., that is reverted at long-term, where the presence of problematic eating is significantly higher than at short-term and similar to the one found preoperatively. These results add evidence to the apparent normalization of eating patterns in the first 24 months, frequently reported in the literature (Bocchieri et al., 2002; Pekkarinen, Koskela, Huikuri, & Mustajoki, 1994). Interestingly, it seemed that while objective

manifestations of loss of control (objective binge eating episodes) are significantly less frequent at short-time and greater again at long-time, the subjective experience of loss of control over eating (subjective binge episodes) does not change significantly, suggesting that the sense of loss of control is present at all time points.

Bariatric surgery also seem to influence associated psychological characteristics, improving eating related symptoms, body image issues, and impulsiveness, general psychological distress and depressive symptoms, both at short and long-term.

We also expected to explore eating disordered related features that influence weight outcomes. In fact, despite the improvement in eating characteristics after surgery, patients reporting loss of control show different weight outcomes. In agreement with Kalarchian et al., 2002 study, both LOC and non-LOC patients lose significant amounts weight with surgery, but LOC patients have a greater increase in BMI after achieving the lowest BMI. Moreover, patients with LOC gain more weight at long-term than at short, while non-LOC patients tend to lose more weight at long-term, suggesting that LOC is associated with deterioration of outcomes while non-LOC patients keep losing weight along the years.

Despite no significant differences were found between the LOC and non-LOC group in BMI, testing the percentage of weight loss (%WL) and weight regain (WR) revealed important differences. Patients with loss of control lose less weight either at short-term and long-term follow-up than patients without loss of control over eating, and do not lose more weight al long-term than at short-term, while non-LOC patients seem to lose more weight in long-term follow-ups. LOC patients also regain more weight at all time points than the non-LOC. However, at long time both groups significantly regain weight, suggesting that weight regain is not solely explained by the presence of loss of control.

These weight outcomes are supported by the psychological associated characteristics. Similar and lower scores in eating symptoms and body shape are presented by LOC and non-LOC patients at short-term, but at long-term LOC patients have more eating symptoms and body shape issues than non-LOC patients. This mirrors the initial improvement for LOC patients and later deterioration in eating pattern previously discussed, while the non-LOC group present the lowest scores at long-term. The high scores in maladaptive eating patterns for LOC patients either at short and long-term might help explaining the poorer weight outcomes at all time points for this group. Moreover, the increase in maladaptive eating patterns questionnaire at long-term for the non-LOC group seems to support the weight regain for both groups at long-term.

Vomiting and Plugging are commonly reported in reaction to dysfunctional eating behaviors after surgery, such as eating rapidly, eating types of foods that patients knew would make them feel bad, eating more than they should, going a long time without eating, etc. The presence of these eating problems might therefore suggest underlying dysfunctional eating behaviors (Pessina, Andreoli, & Vassallo, 2001). In accordance, the higher frequency of vomiting and dumping episodes in LOC patients appear to relate and suggest the presence of a more dysfunctional eating pattern in this group.

Grazing behavior is also associated with poorer outcomes with grazers presenting more weight regains than non-grazers. This dysfunctional eating behavior seems to have a greater and more significant impact on weight loss and BMI when LOC is a comorbid status. Overall, grazers have poorer outcomes mainly when they report associated loss of control over eating.

These results suggest that the presence of either loss of control over eating and grazing behavior seem to play an important role in weight outcomes after bariatric

surgery, being associated with more weight regain and less weight loss, particularly when then appear together. Nonetheless, they do not fully explain this variance in outcomes as statistical significance is not always achieved. Therefore, it seems that a combination of eating related features might better explain the variance in outcomes, which also has been reported by other authors (Lanyon & Maxwell, 2007). The model tested included behavioral features (presence of grazing, loss of control, maladaptive patterns) and cognitive aspects (psychological symptoms, body weight issues), as well as the component of time. Together these characteristics explained a respectable amount of the variance of weight regain (69%) and weight loss (32%), supporting the idea that a worse outcomes are explained by several features, including behavioral and cognitive aspects, and not by a single trace.

Our study has some limitations. First, we were limited to a cross-sectional study and to exploration of differences in frequency of particular behaviors and its relation to outcomes. The lack of longitudinal data hinders the establishment of causal and reciprocal relationship between the presence of dysfunctional eating behaviors and outcomes, and limited the study to the postoperative predictors of treatment outcomes. Therefore, relation between pre-surgery status and weight outcomes, or information on eating patterns change over time was impossible to study. However, clear preoperative predictors have not found consistency in research studies, being postoperative features that seem to predict more strongly outcomes (Mitchell et al., 2001; Scholtz et al., 2007; White et al., 2010)

The number of patients for each type of surgery also wasn't enough to control for this variable. Further research should address variation in outcomes and eating patterns change for the different surgical procedures, in order to understand the effect of the type of restriction on eating patterns and the need of additional help post-surgery.

Another limitation of the current study is related to the follow-up time. The sample was divided in follow-up groups using the cut-off of 24 month referred in the literature (Bocchieri et al., 2002; L. K. G. Hsu et al., 1997), however, patients on T1 group (with less than 24 month F.U. after surgery), where assessed mainly within 6 to 12 months after surgery, at very short follow-up time. On the other hand, in our T2 group (with more than 24 months F.U.), most of the patients had a later follow-up time of more than 7 years. Moreover, the patients underwent surgical treatment for obesity in three different hospital centers, with different surgeons and relatively different treatment protocols, particularly in the follow-up time.

Conclusion

Despite the improvement in eating behavior and related symptomatology with bariatric surgery, weight regain seems to occur in the presence of a constellations of dysfunctional eating features. The predictive value of eating features and its strong association with weight outcomes after bariatric surgery, particularly at long-term, highlights the importance of systematic and continuous monitoring from initial stages to long-term follow-up. In fact, despite weight regain being more evident at long-term and early screen for dysfunctional eating patterns appears to be a reasonable preventive measure of weight regain.

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CONCLUSION

Results presented in this dissertation regarding the pre-surgery psychological characteristics and the long-term outcomes, support the idea that there is a subgroup of patients undergoing bariatric surgery with eating related distinctive characteristics and specific eating behaviors. Also, an important improvement in eating disorder, eating patterns and associated psychological characteristic was observed after surgery, which is in agreement with other research works (Colles et al., 2008; L. Hsu et al., 2002; Kalarchian, Wilson, Brolin, & Bradley, 1998; Gerbrand C. M. van Hout et al., 2005; White et al., 2010).

These data also provide evidence for the impact of disordered eating behavior in weight loss and association with poorer outcomes, and for the apparent initial normalization of eating patterns and eating disturbances (Bocchieri et al., 2002). Nonetheless, the variability in weight outcomes is still considerable, particular at long-term follow-up where dysfunctional eating is most associated with weight regain.

This work also adds evidence to a new line of research of the prognostic significance of eating behavior on surgical outcomes (Lanyon & Maxwell, 2007): the factors leading to successful outcomes our failure to surgery are complex, multiple and time related, which might give some explanation for the mixed data regarding the study of single predictive variables in former research studies.

The question remains on how to improve outcomes in bariatric surgery, particularly at long-term, in an environment of limited resources to deal with an increasing population of patients. In this context, a stepped-care approach seems the most reasonable choice to deliver the adequate amount of help to each patient (Haaga, 2000).

Since eating behaviors present strong association with weight regain or failure to treatment (particularly clear at long-term follow-up), a systematic monitoring and assessment of the specific eating behaviors imposes.

Being a life-time surgery, it is crucial for the obese patients to have the adequate information about the requirements of the surgical treatment and the long-term commitment that it represents, in order to be capable of a fully informed decision. In other hand, with a preventive attitude, the systematic assessment appears to be a good alternative strategy to prevent weight regain and failure to treatment, by early detection of individual key-features and maladaptive eating patterns that that put patients at risk for weight regain.

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APPENDIX I

“Sessions at a Glance”

Session	Main objective	Specific objectives
Initial consultation	Evaluation of the clinical and diagnostic characteristics of the participant	A) Evaluate the suitability of the program to each particular participant B) Introduction to the program
2 - Eating behavior	Promote adequate eating behaviors	D) Relate weight regain with energy intake-expenditure balance E) Identification of overeating F) Educate about strategies for reducing daily caloric intake
2 - Physical activity	Promote active life style	A) Educate about the importance of physical activity after surgery B) Distinguish between physical exercise and physical activity C) Identify strategies to increase physical activity
3 - Obesity surgery	Educate about surgical procedures and post-surgery implications	A) Educate about different surgical procedures B) Tips for pre-surgery and preparation for post-surgery time C) Common problems after surgery: maladaptive behaviors vs healthy behaviors D) Inform about cosmetic surgery after bariatric surgery

Topic	Main objective	Specific objectives
4 - Emotions, Stress and Eating	Understand the relationship between emotions and eating	A) Educate about emotional stress B) Educate about "emotional eating" C) Identify emotional situations related to eating D) Identify strategies to deal with emotional hunger
5 - Goals and expectations	Promote realistic goals and expectations about surgery outcomes	A) Educate for the importance of realistic expectations B) Identify individual meaning of success and failure C) Establish personal realistic expectations
6 - Self-concept and self-care	Educate about the self-worth system	*A)* Understand the main aspects to incorporate the individual self-worth system *B)* Educate about body-image and self-concept *C)* Educate about body checking and "feeling fat"
7 - Social support and significant others	Promote adequate social support system	A) Address possible impact of surgery on others (family, work colleagues, etc) B) Clarify Significant Other's remaining doubts regarding surgery C) Educate about helping the participant adapt to a new life and eating style

APPENDIX I: Overview of the main and specific objectives of each session of the preparation for bariatric surgery program